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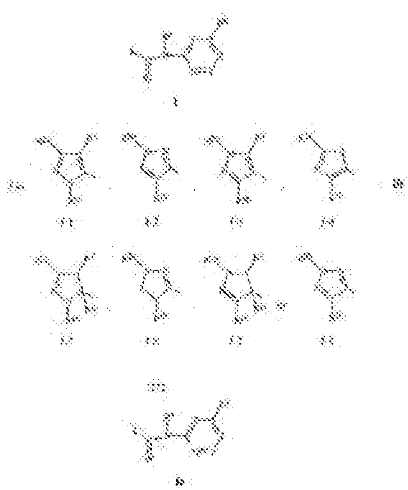
(54) Title: AZOLECARBOXAMIDE HERBICIDES



(57) **Abstract:** Compounds of Formula (I), and their *N*-oxides and agriculturally suitable salts, are disclosed which are useful for controlling undesired vegetation, wherein J is (J-1), (J-2,(J-3), (J-4), (J-5), (J-6), (J-7), (J-8) and R^{1a}, R^{1b}, R^{1c}, R^{2a}, R^{2b}, R^3, R^4, $R0^5$, T, U, W, Y and Z are as defined in the disclosure. Also disclosed are compositions containing the compounds of Formula (I) and a method for controlling undesired vegetation which involves contacting the vegetation or its environment with an effective amount of a compound of Formula (I). Also disclosed are mixtures and compositions comprising a herbicidally effective amount of a compound of Formula (Iz) wherein J, R^{1a}, R^{1b}, R^{1c}, R^{2a}, R^{2b}, R^3, R^4, $R0^5$, T, U, W, Y and Z are as defined in the disclosure; and an effective amount of another herbicide or herbicide safener. Also disclosed is a method for selectively controlling undesired vegetation in a crop that involves contacting the locus of a crop with an effective amount of a compound of Formula (Iz) and a effective amount of a safener.

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TITLE

AZOLECARBOXAMIDE HERBICIDES

FIELD OF THE INVENTION

This invention relates to certain azolecarboxamides their *N*-oxides, agriculturally suitable salts and compositions, and methods of their use for controlling undesirable vegetation.

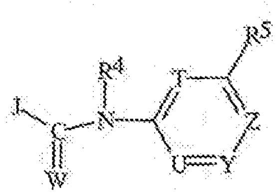
BACKGROUND OF THE INVENTION

The control of undesired vegetation is extremely important in achieving high crop efficiency. Achievement of selective control of the growth of weeds especially in such useful crops as rice, soybean, sugar beet, corn (maize), potato, wheat, barley, tomato and plantation crops, among others, is very desirable. Unchecked weed growth in such useful crops can cause significant reduction in productivity and thereby result in increased costs to the consumer. The control of undesired vegetation in noncrop areas is also important. Many products are commercially available for these purposes, but the need continues for new compounds which are more effective, less costly, less toxic, environmentally safer or have different modes of action.

J. J. Parlow, D. A. Mischke and S. S. Woodard, *J. Org. Chem.* **1997**, *62*, 5908–5919 and J. J. Parlow, *J. Heterocyclic Chem.* **1998**, *35*, 1493–1499 disclose certain pyrazolecarbonylaminobenzene- and pyridinecarboxamides as herbicides. The present Applicants have discovered azolecarboxamides not disclosed by these two publications and which have significantly improved herbicidal utility. Additionally the present Applicants have discovered more efficacious or selective herbicidal compositions and improved methods of weed control from combination of azolecarboxamides with other herbicides and/or herbicide safeners.

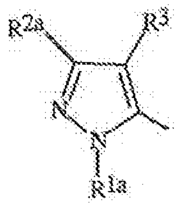
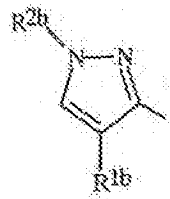
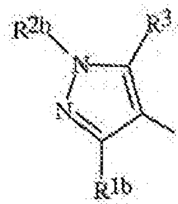
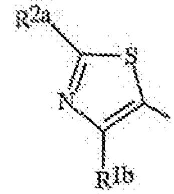
SUMMARY OF THE INVENTION

This invention is directed to a compound of Formula **I** including all geometric and stereoisomers, *N*-oxides or agriculturally suitable salts thereof, agricultural compositions containing them and their use as herbicides:

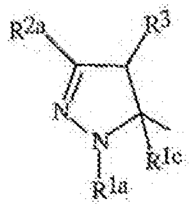
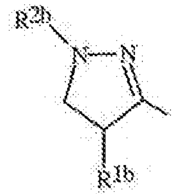
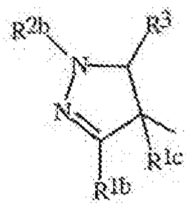
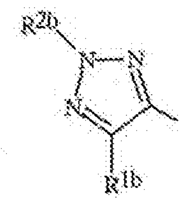


I

wherein

J is  ,  ,  ,  ,

J-1 J-2 J-3 J-4

 ,  ,  or  ;

J-5 J-6 J-7 J-8

T is CR^6 or N;

U is CR^7 or N;

Y is CR^8 or N;

Z is CR^9 or N;

R^{1a} is H, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1b} is halogen, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1c} is H;

R^{2a} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl, C_5–C_6 alkylcycloalkylalkyl, $-CR^{20}(OR^{21})(OR^{22})$ or $SiR^{23}R^{24}R^{25}$;

R^{2b} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl or C_5–C_6 alkylcycloalkylalkyl;

R^3 is H, F or C_1–C_2 alkyl; or

R^{2a} or R^{2b} is taken together with R^3 as $-C(R^{26a})(R^{26b})-(Y^1)_s-(CH_2)_t-(Y^2)_u-$ or $-C(R^{26a})(R^{26b})-(Y^1)_v-CH{=}CH-(Y^2)_w-$ wherein the left end of the radical is connected as R^{2a} or R^{2b}, and the right end of the radical is connected as R^3;

R^4 is H, C_1–C_2 alkyl, C_2–C_6 alkylcarbonyl, C_2–C_6 alkoxycarbonyl, C_2–C_6 alkoxyalkyl or C_2–C_6 alkylthioalkyl;

R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, $C(NOR^{14})R^{15}$, -CN, OR^{16}, $S(O)_mR^{17}$ $S(O)_2NR^{18}R^{19}$, $OS(O)_2R^{27}$ or $OP(O)R^{28a}R^{28b}$;

R^6 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio; or

R^5 and R^6 are taken together as a radical selected from $-C(W^1)N(R^{11})(CH_2)_n-$ and $-C(NOR^{14})CH_2(CH_2)_n-$ wherein the right end of the radical is connected to the ring at T;

R^7 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio;

R^8 and R^9 are independently selected from H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio and C_1–C_2 fluoroalkylthio;

R^{10} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

R^{11} is H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_3–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl; or

R^{10} and R^{11} are taken together as $-(CH_2)_4-$, $-(CH_2)_5-$, $-CH_2CH{=}CHCH_2-$ or $-(CH_2)_2O(CH_2)_2-$, each optionally substituted with 1–2 C_1–C_2 alkyl;

each R^{12} is independently C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_4 alkoxyalkyl, C_2–C_4 alkylthioalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl or C_4–C_5 cycloalkylalkyl;

R^{13} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{14} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_6 alkylcarbonyl or C_2–C_6 alkoxycarbonyl;

R^{15} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{16} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_3 alkoxyalkyl, C_2–C_3 alkylthioalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_5 cycloalkyl or cyclopropylmethyl;

R^{17} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_4 cycloalkyl or cyclopropylmethyl;

each R^{18} is independently H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

each R^{19} is independently H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl;

R^{20} is C_1–C_4 alkyl, cyclopropyl, cyclopropylmethyl or methylcyclopropyl;

R^{21} is C_1–C_3 alkyl;

R^{22} is C_1–C_3 alkyl; or

R^{21} and R^{22} are taken together as $-CH_2CH_2-$ or $-CH_2CH_2CH_2-$, each optionally substituted with 1–2 methyl;

R^{23} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{24} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{25} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{26a} and R^{26b} are independently H or C_1–C_2 alkyl;

R^{27} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{28a} and R^{28b} are independently C_1–C_2 alkyl or C_1–C_2 alkoxy;

W is O or S;

W^1 is O or S;

Y^1 and Y^2 are independently CH_2, O, S, NH or NCH_3;

m is 0, 1 or 2;

n is 1 or 2;

s is 0 or 1; t is 1 or 2; and u is 0 or 1; provided that the sum of s, t and u is 2 or 3; and

v is 0 or 1; w is 0 or 1; provided that the sum of v and w is 0 or 1;

provided that

(a) when J is J-1, R^{1a} is CH_3 and R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, OR^{16} or $S(O)_mR^{17}$, then at least one of T, U, Y and Z is N or C-F;

(b) when J is J-1, R^{1a} is CH_3, R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, OR^{16} or $S(O)_mR^{17}$ and T is N, then at least one of U, Y and Z is N or C-F;

(c) when R^5 is $C(W^1)NR^{10}R^{11}$ or $C(NOR^{14})R^{15}$, then R^9 is other than alkoxy or alkylthio;

(d) when R^5 is $C(W^1)NR^{10}R^{11}$, then R^6 is other than alkyl or alkoxy;

(e) when R^5 is COR^{13}, then R^{1a} or R^{1b} is selected from the radicals of the group consisting of C_1–C_3 alkyl, C_1–C_3 fluoroalkyl, C_2–C_3 alkenyl, C_2–C_3 fluoroalkenyl, C_2–C_3 alkynyl or C_2–C_3 fluoroalkynyl, each radical unbranched and connected through a terminal end carbon atom to the azole ring;

(f) when R^5 and R^6 are taken together as $-C(W^1)N(R^{10})(CH_2)_n-$ and n is 1, then R^{10} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

(g) when at least one of R^{10} and R^{11} is haloalkyl, then R^{1a} or R^{1b} is CH_2CH_3 or CH_2CF_3 and R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl;

(h) when J is J-2 or J-6, then R^7 and R^9 are H;

(i) when J is J-2 or J-6, and R^{2b} is C_1–C_2 alkyl, then R^{1b} is halogen, C_2–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

(j) when R^{1a} is CH_3 and R^5 is $C(NOR^{14})R^{15}$, then R^7 is other than alkyl;

(k) when T is N, then Z is CR^9;

(l) when T is N, R^7 is alkoxy, then R^{11} is H;

(m) when R^7 and R^9 are F, and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than H;

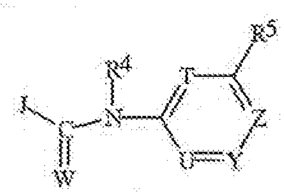
(n) when Z is N and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than trifluoroethyl;

(o) when J is J-8 and R^{2b} is C_5–C_6 cycloalkyl, then R^5 is $C(O)NR^{10}R^{11}$; and

(p) when J is J-8 and R^7 is other than H, then R^{2b} is *tert*-butyl and R^5 is $C(O)NR^{10}R^{11}$.

More particularly, this invention pertains to a compound of Formula **I**, including all geometric and stereoisomers, *N*-oxides or agriculturally suitable salts thereof. This invention also relates to a herbicidal composition comprising a herbicidally effective amount of a compound of Formula **I** and at least one of a surfactant, a solid diluent or a liquid diluent. This invention further relates to a method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with a herbicidally effective amount of a compound of Formula **I** (e.g., as a composition described herein). This invention also relates to a method for selectively controlling the growth of undesired vegetation in a crop comprising contacting the locus of the crop with a herbicidally effective amount of a compound of Formula **I** and an antidotally effective amount of a safener.

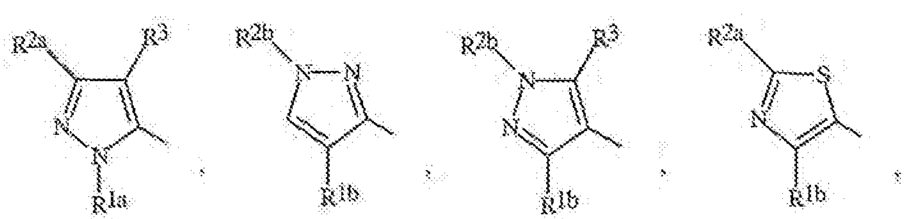
The present invention also relates to a herbicidal mixture comprising a herbicidally effective amount of a compound of Formula **Iz** including all geometric and stereoisomers, *N*-oxides and agriculturally suitable salts thereof



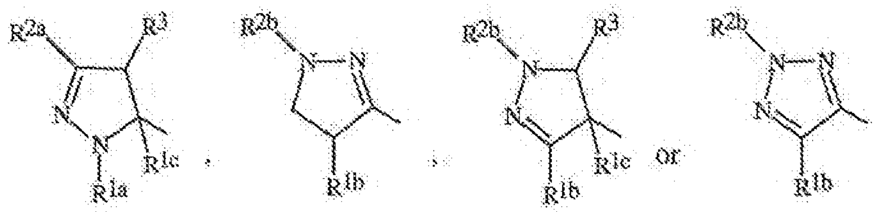
Iz

wherein

J is



J-1 J-2 J-3 J-4



J-5 J-6 J-7 or J-8 ;

T is CR^6 or N;

U is CR^7 or N;

Y is CR^8 or N;

Z is CR^9 or N;

R^{1a} is H, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1b} is halogen, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1c} is H;

R^{2a} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl, C_5–C_6 alkylcycloalkylalkyl, $-CR^{20}(OR^{21})(OR^{22})$ or $SiR^{23}R^{24}R^{25}$;

R^{2b} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl or C_5–C_6 alkylcycloalkylalkyl;

R^3 is H, F or C_1–C_2 alkyl; or

R^{2a} or R^{2b} is taken together with R^3 as $-C(R^{26a})(R^{26b})-(Y^1)_s-(CH_2)_t-(Y^2)_u-$ or $-C(R^{26a})(R^{26b})-(Y^1)_v-CH{=}CH-(Y^2)_w-$ wherein the left end of the radical is connected as R^{2a} or R^{2b}, and the right end of the radical is connected as R^3;

R^4 is H, C_1–C_2 alkyl, C_2–C_6 alkylcarbonyl, C_2–C_6 alkoxycarbonyl, C_2–C_6 alkoxyalkyl or C_2–C_6 alkylthioalkyl;

R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, $C(NOR^{14})R^{15}$, -CN, OR^{16}, $S(O)_mR^{17}$ $S(O)_2NR^{18}R^{19}$, $OS(O)_2R^{27}$ or $OP(O)R^{28a}R^{28b}$;

R^6 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio; or

R^5 and R^6 are taken together as a radical selected from $-C(W^1)N(R^{11})(CH_2)_n-$ and $-C(NOR^{14})CH_2(CH_2)_n-$ wherein the right end of the radical is connected to the ring at T;

R^7 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio;

R^8 and R^9 are independently selected from H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio and C_1–C_2 fluoroalkylthio;

R^{10} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

R^{11} is H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl; or

R^{10} and R^{11} are taken together as -$(CH_2)_4$-, -$(CH_2)_5$-, -CH_2CH=$CHCH_2$- or -$(CH_2)_2O(CH_2)_2$-, each optionally substituted with 1–2 C_1–C_2 alkyl;

each R^{12} is independently C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_4 alkoxyalkyl, C_2–C_4 alkylthioalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl or C_4–C_5 cycloalkylalkyl;

R^{13} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{14} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_6 alkylcarbonyl or C_2–C_6 alkoxycarbonyl;

R^{15} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{16} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_3 alkoxyalkyl, C_2–C_3 alkylthioalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_5 cycloalkyl or cyclopropylmethyl;

R^{17} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_4 cycloalkyl or cyclopropylmethyl;

each R^{18} is independently H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

each R^{19} is independently H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl;

R^{20} is C_1–C_4 alkyl, cyclopropyl, cyclopropylmethyl or methylcyclopropyl;

R^{21} is C_1–C_3 alkyl;

R^{22} is C_1–C_3 alkyl; or

R^{21} and R^{22} are taken together as -CH_2CH_2- or -$CH_2CH_2CH_2$-, each optionally substituted with 1–2 methyl;

R^{23} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{24} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{25} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{26a} and R^{26b} are independently H or C_1–C_2 alkyl;

R^{27} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{28a} and R^{28b} are independently C_1–C_2 alkyl or C_1–C_2 alkoxy;

W is O or S;

W^1 is O or S;

Y^1 and Y^2 are independently CH_2, O, S, NH or NCH_3;

m is 0, 1 or 2;

n is 1 or 2;

s is 0 or 1; t is 1 or 2; and u is 0 or 1; provided that the sum of s, t and u is 2 or 3; and

v is 0 or 1; w is 0 or 1; provided that the sum of v and w is 0 or 1;

provided that

(a) when R^5 is $C(W^1)NR^{10}R^{11}$ or $C(NOR^{14})R^{15}$, then R^9 is other than alkoxy or alkylthio;

(b) when R^5 is $C(W^1)NR^{10}R^{11}$, then R^6 is other than alkyl or alkoxy;

(c) when R^5 is COR^{13}, then R^{1a} or R^{1b} is selected from the radicals of the group consisting of C_1–C_3 alkyl, C_1–C_3 fluoroalkyl, C_2–C_3 alkenyl, C_2–C_3 fluoroalkenyl, C_2–C_3 alkynyl or C_2–C_3 fluoroalkynyl, each radical unbranched and connected through a terminal end carbon atom to the azole ring;

(d) when R^5 and R^6 are taken together as $-C(W^1)N(R^{10})(CH_2)_n-$ and n is 1, then R^{10} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

(e) when at least one of R^{10} and R^{11} is haloalkyl, then R^{1a} or R^{1b} is CH_2CH_3 or CH_2CF_3 and R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl;

(f) when J is J-2 or J-6, then R^7 and R^9 are H;

(g) when J is J-2 or J-6, and R^{2b} is C_1–C_2 alkyl, then R^{1b} is halogen, C_2–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

(h) when R^{1a} is CH_3 and R^5 is $C(NOR^{14})R^{15}$, then R^7 is other than alkyl;

(i) when T is N, then Z is CR^9;

(j) when T is N, R^7 is alkoxy, then R^{11} is H;

(k) when R^7 and R^9 are F, and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than H;

(l) when Z is N and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than trifluoroethyl;

(m) when J is J-8 and R^{2b} is C_5–C_6 cycloalkyl, then R^5 is $C(O)NR^{10}R^{11}$; and

(n) when J is J-8 and R^7 is other than H, then R^{2b} is *tert*-butyl and R^5 is $C(O)NR^{10}R^{11}$;

and an effective amount of at least one additional active ingredient selected from the group consisting of an other herbicide and a herbicide safener. The present invention further

relates to a herbicidal composition comprising said herbicidal mixture and at least one of a surfactant, a solid diluent or a liquid diluent.

The present invention also relates to a method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with a herbicidally effective amount of a compound of Formula **Iz** and effective amount of at least one additional active ingredient selected from the group consisting of an other herbicide and a herbicide safener (e.g., in the form of the aforedescribed herbicidal mixture or herbicidal composition). A particular aspect of the present invention relates to a method for selectively controlling the growth of undesired vegetation in a crop comprising contacting the locus of a crop with an effective amount of a compound of Formula **Iz** and an antidotally effective amount of a herbicide safener (e.g., safener applied as a seed treatment).

DETAILS OF THE INVENTION

In the above recitations, the term "alkyl", used either alone or in compound words such as "alkylthio" or "haloalkyl" includes straight-chain or branched alkyl, such as, methyl, ethyl, *n*-propyl, *i*-propyl, or the different butyl, pentyl or hexyl isomers. The term "1–2 alkyl" indicates that one or two of the available positions for that substituent may be alkyl which are independently selected. "Alkenyl" includes straight-chain or branched alkenes such as ethenyl, 1-propenyl, 2-propenyl, and the different butenyl, pentenyl and hexenyl isomers. "Alkenyl" also includes polyenes such as 1,2-propadienyl and 2,4-hexadienyl. "Alkynyl" includes straight-chain or branched alkynes such as ethynyl, 1-propynyl, 2-propynyl and the different butynyl, pentynyl and hexynyl isomers. "Alkynyl" can also include moieties comprised of multiple triple bonds such as 2,5-hexadiynyl. "Alkoxy" includes, for example, methoxy, ethoxy, *n*-propyloxy, isopropyloxy and the different butoxy and pentoxy isomers. "Alkoxyalkyl" denotes alkoxy substitution on alkyl. Examples of "alkoxyalkyl" include CH_3OCH_2, $CH_3OCH_2CH_2$, $CH_3CH_2OCH_2$, $CH_3CH_2CH_2CH_2OCH_2$ and $CH_3CH_2OCH_2CH_2$. "Alkylthio" includes branched or straight-chain alkylthio moieties such as methylthio, ethylthio, and the different propylthio, butylthio and pentylthio isomers. "Alkylthioalkyl" denotes alkylthio substitution on alkyl. Examples of "alkylthioalkyl" include CH_3SCH_2, $CH_3SCH_2CH_2$, $CH_3CH_2SCH_2$, $CH_3CH_2CH_2CH_2SCH_2$ and $CH_3CH_2SCH_2CH_2$. "Alkylsulfinyl" includes both enantiomers of an alkylsulfinyl group. Examples of "alkylsulfinyl" include $CH_3S(O)$, $CH_3CH_2S(O)$, $CH_3CH_2CH_2S(O)$, $(CH_3)_2CHS(O)$ and the different butylsulfinyl isomers. Examples of "alkylsulfonyl" include $CH_3S(O)_2$, $CH_3CH_2S(O)_2$, $CH_3CH_2CH_2S(O)_2$, $(CH_3)_2CHS(O)_2$ and the different butylsulfonyl isomers. "Alkenylthio", "alkenylsulfinyl", "alkenylsulfonyl", "alkynylthio", "alkynylsulfinyl", "alkynylsulfonyl", and the like, are defined analogously to the above examples. "Cycloalkyl" includes, for example, cyclopropyl, cyclobutyl, cyclopentyl, and cyclohexyl. The term "cycloalkoxy" includes the same groups linked through an oxygen atom such as cyclopropyloxy and cyclobutyloxy. Examples of "cycloalkylalkyl" include

cyclopropylmethyl, cyclopentylethyl, and other cycloalkyl moieties bonded to straight-chain or branched alkyl groups. "Cycloalkylalkoxy" includes cyclopropylmethoxy. "Alkylcycloalkyl" denotes alkyl substitution on a cycloalkyl moiety. Examples include 4-methylcyclohexyl and 3-ethylcyclopentyl. The term "carbocyclic ring" denotes a ring wherein the atoms forming the ring backbone and selected only from carbon. "Saturated carbocyclic" refers to a ring having a backbone consisting of carbon atoms linked to one another by single bonds; unless otherwise specified, the remaining carbon valences are occupied by hydrogen atoms. The term "aromatic ring system" denotes fully unsaturated carbocycles and heterocycles in which the polycyclic ring system is aromatic. Aromatic indicates that each of ring atoms is essentially in the same plane and has a *p*-orbital perpendicular to the ring plane, and in which $(4n + 2)$ π electrons, where n is 0 or a positive integer, are associated with the ring to comply with Hückel's rule. The term "aromatic carbocyclic ring system" includes fully aromatic carbocycles and carbocycles in which at least one ring of a polycyclic ring system is aromatic. The term "nonaromatic carbocyclic ring system" denotes fully saturated carbocycles as well as partially or fully unsaturated carbocycles wherein none of the rings in the ring system are aromatic. The terms "aromatic heterocyclic ring system" and "heteroaromatic ring" include fully aromatic heterocycles and heterocycles in which at least one ring of a polycyclic ring system is aromatic. The term "nonaromatic heterocyclic ring system" denotes fully saturated heterocycles as well as partially or fully unsaturated heterocycles wherein none of the rings in the ring system are aromatic. The heterocyclic ring systems can be attached through any available carbon or nitrogen by replacement of a hydrogen on said carbon or nitrogen. One skilled in the art will appreciate that not all nitrogen-containing heterocycles can form *N*-oxides since the nitrogen requires an available lone pair for oxidation to the oxide; one skilled in the art will recognize those nitrogen-containing heterocycles which can form *N*-oxides. Synthetic methods for the preparation of *N*-oxides of heterocycles are very well known by one skilled in the art including the oxidation of heterocycles and tertiary amines with peroxy acids such as peracetic and *m*-chloroperbenzoic acid (MCPBA), hydrogen peroxide, alkyl hydroperoxides such as *t*-butyl hydroperoxide, sodium perborate, and dioxiranes such as dimethydioxirane. These methods for the preparation of *N*-oxides have been extensively described and reviewed in the literature, see for example: T. L. Gilchrist in *Comprehensive Organic Synthesis*, vol. 7, pp 748–750, S. V. Ley, Ed., Pergamon Press; M. Tisler and B. Stanovnik in *Comprehensive Heterocyclic Chemistry*, vol. 3, pp 18–20, A. J. Boulton and A. McKillop, Eds., Pergamon Press; M. R. Grimmett and B. R. T. Keene in *Advances in Heterocyclic Chemistry*, vol. 43, pp 149–161, A. R. Katritzky, Ed., Academic Press; M. Tisler and B. Stanovnik in *Advances in Heterocyclic Chemistry*, vol. 9, pp 285–291, A. R. Katritzky and A. J. Boulton, Eds., Academic Press; and G. W. H. Cheeseman and E. S. G. Werstiuk in

Advances in Heterocyclic Chemistry, vol. 22, pp 390–392, A. R. Katritzky and A. J. Boulton, Eds., Academic Press.

The term "halogen", either alone or in compound words such as "haloalkyl", includes fluorine, chlorine, bromine or iodine. The term "1–2 halogen" indicates that one or two of the available positions for that substituent may be halogen which are independently selected. Further, when used in compound words such as "haloalkyl", said alkyl may be partially or fully substituted with halogen atoms which may be the same or different. Examples of "haloalkyl" include F_3C, $ClCH_2$, CF_3CH_2 and CF_3CCl_2. The terms "haloalkenyl", "haloalkynyl", "haloalkoxy", "haloalkylthio", and the like, are defined analogously to the term "haloalkyl". Examples of "haloalkenyl" include $(Cl)_2C{=}CHCH_2$ and $CF_3CH_2CH{=}CHCH_2$. Examples of "haloalkynyl" include $HC{\equiv}CCHCl$, $CF_3C{\equiv}C$, $CCl_3C{\equiv}C$ and $FCH_2C{\equiv}CCH_2$. Examples of "haloalkoxy" include CF_3O, CCl_3CH_2O, $HCF_2CH_2CH_2O$ and CF_3CH_2O. Examples of "haloalkylthio" include CCl_3S, CF_3S, CCl_3CH_2S and $ClCH_2CH_2CH_2S$. Examples of "haloalkylsulfinyl" include $CF_3S(O)$, $CCl_3S(O)$, $CF_3CH_2S(O)$ and $CF_3CF_2S(O)$. Examples of "haloalkylsulfonyl" include $CF_3S(O)_2$, $CCl_3S(O)_2$, $CF_3CH_2S(O)_2$ and $CF_3CF_2S(O)_2$. Similarly, "fluoroalkyl", "fluoroalkenyl" and "fluoroalkynyl" may be partially or fully substituted with fluorine atoms.

The total number of carbon atoms in a substituent group is indicated by the "C_i–C_j" prefix where i and j are numbers from 1 to 6. For example, C_1–C_3 alkyl designates methyl through propyl; C_2 alkoxyalkyl designates CH_3OCH_2; C_3 alkoxyalkyl designates, for example, $CH_3CH(OCH_3)$, $CH_3OCH_2CH_2$ or $CH_3CH_2OCH_2$; and C_4 alkoxyalkyl designates the various isomers of an alkyl group substituted with an alkoxy group containing a total of four carbon atoms, examples including $CH_3CH_2CH_2OCH_2$ and $CH_3CH_2OCH_2CH_2$. Examples of "alkylcarbonyl" include $C(O)CH_3$, $C(O)CH_2CH_2CH_3$ and $C(O)CH(CH_3)_2$. Examples of "alkoxycarbonyl" include $CH_3OC(=O)$, $CH_3CH_2OC(=O)$, $CH_3CH_2CH_2OC(=O)$, $(CH_3)_2CHOC(=O)$ and the different butoxy- or pentoxycarbonyl isomers.

When a compound is substituted with a substituent bearing a subscript that indicates the number of said substituents can exceed 1, said substituents (when they exceed 1) are independently selected from the group of defined substituents. Further, when the subscript indicates a range, e.g. $(R)_{i-j}$, then the number of substituents may be selected from the integers between i and j inclusive.

When a group contains a substituent which can be hydrogen, for example R^6 or R^{10}, then, when this substituent is taken as hydrogen, it is recognized that this is equivalent to said group being unsubstituted. When a position on a group is said to be "not substituted" or "unsubstituted", then hydrogen atoms are attached to take up any free valency.

Compounds of this invention can exist as one or more stereoisomers. The various stereoisomers include enantiomers, diastereomers, atropisomers and geometric isomers. One

skilled in the art will appreciate that one stereoisomer may be more active and/or may exhibit beneficial effects when enriched relative to the other stereoisomer(s) or when separated from the other stereoisomer(s). Additionally, the skilled artisan knows how to separate, enrich, and/or to selectively prepare said stereoisomers. Accordingly, the present invention comprises compounds selected from Formula I, *N*-oxides and agriculturally suitable salts thereof. The compounds of the invention may be present as a mixture of stereoisomers, individual stereoisomers, or as an optically active form.

The agriculturally suitable salts of the compounds of the invention include acid-addition salts with inorganic or organic acids such as hydrobromic, hydrochloric, nitric, phosphoric, sulfuric, acetic, butyric, fumaric, lactic, maleic, malonic, oxalic, propionic, salicylic, tartaric, 4-toluenesulfonic or valeric acids. The agriculturally suitable salts of the compounds of the invention also include those formed with strong bases (e.g., hydrides or hydroxides of sodium, potassium or lithium). One skilled in the art recognizes that because in the environment and under physiological conditions salts of the compounds of the invention are in equibrium with their corresponding nonsalt forms, agriculturally suitable salts share the biological utility of the nonsalt forms.

Preferred for reason of cost, ease of synthesis and/or biological efficacy is:

Preferred 1. A compound of Formula **I** wherein when J is J-1 and R^{1a} is CH_3 then at least one of T and U is N or C-F.

Preferred 2. A compound of Preferred 1 wherein when J is J-1 and R^{1a} is CH_3 then at least one of T and U is C-F.

Preferred 3. A compound of Formula **I** wherein when J is J-1, R^{1a} is CH_3 and T is N then U is N or C-F.

Preferred 4. A compound of Preferred 3 wherein when J is J-1, R^{1a} is CH_3 and T is N then U is C-F.

Preferred 5. A compound of Formula **I** wherein at most one of T, U, Y and Z is N.

Preferred 6. A compound of Formula **I** wherein W is O.

Preferred 7. A compound of Formula **I** wherein J is J-1, J-2, J-3, J-4, J-5 or J-8.

Preferred 8. A compound of Preferred 7 wherein J is J-1, J-3 or J-5.

Preferred 9. A compound of Preferred 8 wherein J is J-1 or J-3.

Preferred 10. A compound of Formula **I** wherein R^{1a} is C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl.

Preferred 11. A compound of Formula **I** wherein R^{1a} or R^{1b} is selected from the radicals in the group consisting of C_1–C_3 alkyl, C_1–C_3 fluoroalkyl, C_2–C_3 alkenyl, C_2–C_3 fluoroalkenyl, C_2–C_3 alkynyl or C_2–C_3 fluoroalkynyl, each radical unbranched and connected through a terminal end carbon atom to the azole ring.

Preferred 12. A compound of Preferred 11 wherein R^{1a} or R^{1b} is CH_2CH_3, CH_2CH_2F, CH_2CHF_2, CH_2CF_3 or $CH=CH_2$.

Preferred 13. A compound of Preferred 12 wherein R^{1a} or R^{1b} is CH_2CH_3 or CH_2CF_3.

Preferred 14. A compound of Formula **I** wherein R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl.

Preferred 15. A compound of Preferred 14 wherein R^{2a} or R^{2b} is *tert*-butyl or isopropyl.

Preferred 16. A compound of Formula **I** wherein Y^1 and Y^2 are independently CH_2 or O;

Preferred 17. A compound of Preferred 16 wherein the sum of s, t and u is 2 and the sum of v and w is 0;

Preferred 18. A compound of Preferred 16 wherein R^{26a} is C_1–C_2 alkyl.

Preferred 19. A compound of Preferred 18 wherein R^{26a} and R^{26b} are CH_3.

Preferred 20. A compound of Formula **I** wherein R^3 is H.

Preferred 21. A compound of Formula **I** wherein R^4 is H.

Preferred 22. A compound of Formula **I** wherein the carbon atom of R^{12} linking to oxygen is bonded to at least one hydrogen atom.

Preferred 23. A compound of Formula **I** wherein R^5 is $CONR^{10}R^{11}$ or $C(O)OR^{12}$; R^{10} is H or C_1–C_4 alkyl; R^{11} is C_1–C_4 alkyl; or R^{10} and R^{11} are taken together as $-CH_2CH=CH_2CH-$; and R^{12} is C_1–C_3 alkyl.

Preferred 24. A compound of Preferred 23 wherein R^5 is $CONR^{10}R^{11}$; R^{10} is H or C_1–C_2 alkyl; and R^{11} is C_1–C_3 alkyl; or R^{10} and R^{11} are taken together as $-CH_2CH=CH_2CH-$.

Preferred 25. A compound of Formula **I** wherein R^6 is H or F.

Preferred 26. A compound of Formula **I** wherein R^7 is H or F.

Preferred 27. A compound of Formula **I** wherein R^8 and R^9 are H or F.

Preferred 28. A compound of Formula **I** wherein T is C-F or N.

Preferred 29. A compound of Formula **I** wherein U is C-F or N.

Of note is a compound of Formula **I** wherein J is J-1 and R^{1a} is H, which is particularly useful as a synthetic intermediate.

Combinations of preferred groups are illustrated by:

Preferred A. A compound of Formula **I** wherein J is J-1, J-2, J-3, J-4, J-5 or J-8.

Preferred B. A compound of Preferred A wherein R^{1a} or R^{1b} is CH_2CH_3, CH_2CH_2F, CH_2CHF_2, CH_2CF_3 or $CH=CH_2$; R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl; R^3 is H; R^4 is H; and W is O.

Preferred C. A compound of Preferred B wherein at most one of T, U, Y and Z is N.

Preferred D. A compound of Preferred C wherein R^5 is $CONR^{10}R^{11}$ or $C(O)OR^{12}$; R^{10} is H or C_1–C_4 alkyl; R^{11} is C_1–C_4 alkyl; or R^{10} and R^{11} are taken together as $-CH_2CH=CH_2CH-$; and R^{12} is C_1–C_3 alkyl.

Preferred E. A compound of Preferred D wherein R^6 is H or F and R^7 is H or F.

Preferred F. A compound of Preferred E wherein J is J-1, J-3 or J-5.

Preferred G. A compound of Preferred F wherein R^5 is $CONR^{10}R^{11}$; R^{10} is H or C_1–C_2 alkyl; and R^{11} is C_1–C_3 alkyl; or R^{10} and R^{11} are taken together as $-CH_2CH{=}CH_2CH-$.

Preferred H. A compound of Preferred G wherein R^{2a} is *tert*-butyl or isopropyl; and R^8 and R^9 are H or F.

Preferred I. A compound of Formula **I** wherein at most one of T, U, Y and Z is N; R^{1a} or R^{1b} is selected from the radicals in the group consisting of C_1–C_3 alkyl, C_1–C_3 fluoroalkyl, C_2–C_3 alkenyl, C_2–C_3 fluoroalkenyl, C_2–C_3 alkynyl or C_2–C_3 fluoroalkynyl, each radical unbranched and connected through a terminal end carbon atom to the azole ring; R^6 is H or F; R^7 is H or F; R^4 is H; R^{26a} is C_1–C_2 alkyl; W is O; Y^1 and Y^2 are independently CH_2 or O; the sum of s, t and u is 2; and the sum of v and w is 0.

Preferred J. A compound of Preferred I wherein R^{1a} or R^{1b} is CH_2CH_3, CH_2CH_2F, CH_2CHF_2, CH_2CF_3 or $CH{=}CH_2$, R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl, and R^3 is H.

Preferred K. A compound of Preferred J wherein R^5 is $CONR^{10}R^{11}$ or $C(O)OR^{12}$; R^{10} is H or C_1–C_4 alkyl; R^{11} is C_1–C_4 alkyl; or R^{10} and R^{11} are taken together as $-CH_2CH{=}CH_2CH-$; and R^{12} is C_1–C_3 alkyl.

Preferred L. A compound of Preferred K wherein R^{2a} or R^{2b} is *tert*-butyl or isopropyl.

Preferred M. A compound of Preferred L wherein J is J-1, J-2, J-3, J-4, J-5 or J-8.

Preferred N. A compound of Preferred M wherein R^5 is $CONR^{10}R^{11}$; R^{10} is H or C_1–C_2 alkyl; and R^{11} is C_1–C_3 alkyl; or R^{10} and R^{11} are taken together as $-CH_2CH{=}CH_2CH-$.

Preferred O. A compound of Preferred N wherein R^8 and R^9 are H or F.

Preferred P. A compound of Preferred O wherein J is J-1, J-3 or J-5.

Specifically preferred is a compound of Preferred I selected from the group:

3-(1,1-dimethylethyl)-1-ethyl-*N*-[5-[(ethylamino)carbonyl]-2-fluorophenyl]-1*H*-pyrazole-5-carboxamide;

N-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide;

2-[[(3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-*N*,*N*-dimethyl-4-pyridinecarboxamide;

2-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-*N*-ethyl-4-pyridinecarboxamide;

N-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-1-ethyl-3-(1-methylethyl)-1*H*-pyrazole-5-carboxamide;

N-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxamide;

3-(1,1-dimethylethyl)-1-(2-fluoroethyl)-*N*-[3-[(1*E*)-1-(hydroxyimino)ethyl]phenyl]-1*H*-pyrazole-5-carboxamide;

3-(1,1-dimethylethyl)-1-ethyl-*N*-[5-[(ethylmethylamino)carbonyl]-2-fluorophenyl]-1*H*-pyrazole-5-carboxamide;

3-(1,1-dimethylethyl)-1-ethyl-*N*-[3-[(ethylamino)carbonyl]-4-fluorophenyl]-1*H*-pyrazole-5-carboxamide;

N-[5-[(2,5-dihydro-1*H*-pyrrol-1-yl)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide; and

3-(1,1-dimethylethyl)-1-ethyl-*N*-[3-(trifluoromethoxy)phenyl]-1*H*-pyrazole-5-carboxamide.

Of note are compounds of Formula **I** wherein J is J-1, J-2, J-3 or J-4 wherein R^{2a} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl or C_5–C_6 alkylcycloalkylalkyl. Also of note are compounds of Formula **I** wherein J is J-1, J-2, J-3, J-4, J-5, J-6 or J-7. Also of note are compounds of Formula **I** wherein R^{2a} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl, C_5–C_6 alkylcycloalkylalkyl, $-CR^{20}(OR^{21})(OR^{22})$ or $SiR^{23}R^{24}R^{25}$; R^{2b} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl or C_5–C_6 alkylcycloalkylalkyl; R^3 is H, F or C_1–C_2 alkyl; and R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, $C(NOR^{14})R^{15}$, -CN, OR^{16}, $S(O)_mR^{17}$ or $S(O)_2NR^{18}R^{19}$.

The preferred herbicidal compositions of the present invention are those involving the above preferred compounds.

This invention also relates to a method for controlling undesired vegetation comprising applying to the locus of the vegetation herbicidally effective amounts of the compounds of the invention (e.g., as a composition described herein). The preferred methods of use are those involving the above preferred compounds.

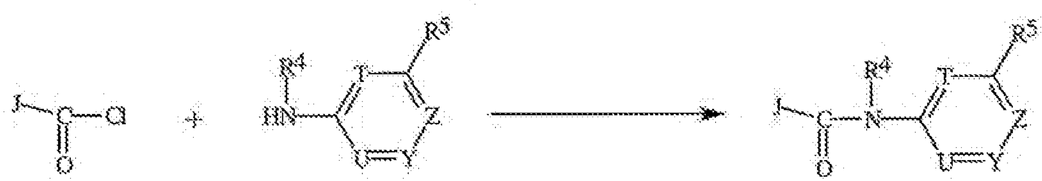
This invention also relates to a method for selectively controlling the growth of undesired vegetation in a crop comprising contacting the locus of the crop with a

herbicidally effective amount of the compounds of the invention and an antidotally effective amount of a safener. The preferred methods of use are those involving the above preferred compounds.

The compounds of Formulae **I** and **Iz** can be prepared by one or more of the following methods and variations as described in Schemes 1 through 20 and accompanying text. Formula **I** is a subgenus of Formula **Iz**; Formulae **I** and **Iz** share the same substituent group definitions, but the scope of Formula **Iz** is not constrained by provisos (a) and (b) of Formula **I**. The definitions of J, W, R^{1a}, R^{1b}, R^{1c}, R^{2a}, R^{2b}, R^3, R^4, R^5, R^6, R^7, R^8, R^9, R^{10}, R^{11}, R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17}, R^{18}, R^{19}, R^{20}, R^{21}, R^{22}, R^{23}, R^{24}, R^{25}, R^{26a}, R^{26b}, R^{27}, R^{28a}, R^{28b}, W, W^1, T, U, Y, Z, m, n, s and v in the compounds of Formulae **I** through **Ig**, **Iz** and **1** through **63** below are as defined above in the Summary of the Invention unless otherwise indicated. Compounds of Formulae **Ia** through **Ig** are various subsets of the compounds of Formulae **I** and **Iz**, compounds of Formula **2a** and **2b** are subsets of the compounds of Formula **2**, and compounds of Formulae **17a** through **17j** are subsets of the compounds of Formula **17**.

Compounds of Formula **Ia** (Formula **I** or **Iz** wherein W is O) can be prepared by coupling the appropriately subtitituted azole acyl chloride of Formula **1** with the appropriately substituted amino compound of Formula **2** as shown in Scheme 1.

Scheme 1

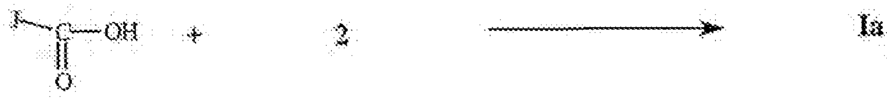


1 **2** **Ia**

The reaction is carried out in an anhydrous aprotic solvent such as dichloromethane or tetrahydrofuran, preferably in the presence of a base such as triethylamine, pyridine, 4-(dimethylamino)pyridine or *N,N*-diisopropylethylamine, at a temperature typically between room temperature and 70 °C to provide the amide of Formula **Ia**. When R^4 is alkylcarbonyl or alkoxycarbonyl, a strong base such as sodium hydroxide and phase transfer conditions such as those described by M. J. Haddadin et al., *Heterocycles* **1984**, 22, 773 may be advantageous. The reaction of Scheme 1 is illustrated in Step F of Example 1, Step C of Example 4, Step D of Example 7, Step D of Example 8, Step C of Example 12, Step B of Example 13, Step D of Example 14, Step C of Example 15, Step C of Example 16, Step D of Example 19, and Step E of Example 25, which follow.

Alternatively, compounds of Formula **Ia** can be prepared by coupling the appropriately substituted azole carboxylic acid of Formula **3** with appropriately substituted amino compound of Formula **2** as shown in Scheme 2.

Scheme 2

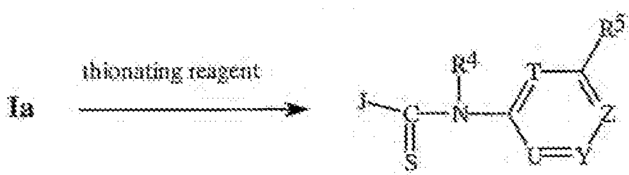


3

This reaction is carried out in the presence of a dehydrating coupling reagent such as dicyclohexyl carbodiimide, 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide, 1-propanephosphonic acid cyclic anhydride or carbonyl diimidazole in the presence of a base such as triethylamine, pyridine, 4-(dimethylamino)pyridine or *N*,*N*-diisopropylethylamine in an anhydrous aprotic solvent such as dichloromethane or tetrahydrofuran at a temperature typically between room temperature and 70 °C. The method of Scheme 2 is illustrated in Step D of Example 10, Step C of Example 17, Example 18, Step B of Example 20 and Step E of Example 22.

As shown in Scheme 3, compounds of Formula **Ib** (Formula **I** or **Iz** wherein W is S) can be prepared from corresponding compounds of Formula **Ia** by treatment with a thionating reagent such as P_2S_5 (see for example, E. Klingsberg et al., *J. Am. Chem. Soc.* **1951**, *72*, 4988; E. C. Taylor Jr. et al., *J. Am. Chem. Soc.* **1953**, *75*, 1904; R. Crossley et al., *J. Chem. Soc. Perkin Trans. 1* **1976**, 977; J. Voss et al., *Justus Liebigs Ann. Chem.* **1968**, *716*, 209) or Lawesson's Reagent (2,5-bis(4-methoxyphenyl)-1,3-dithia-2,4-diphosphetane-2,4-disulfide; see, for example, S. Prabhakar et al. *Synthesis*, **1984** (10), 829).

Scheme 3



Ib

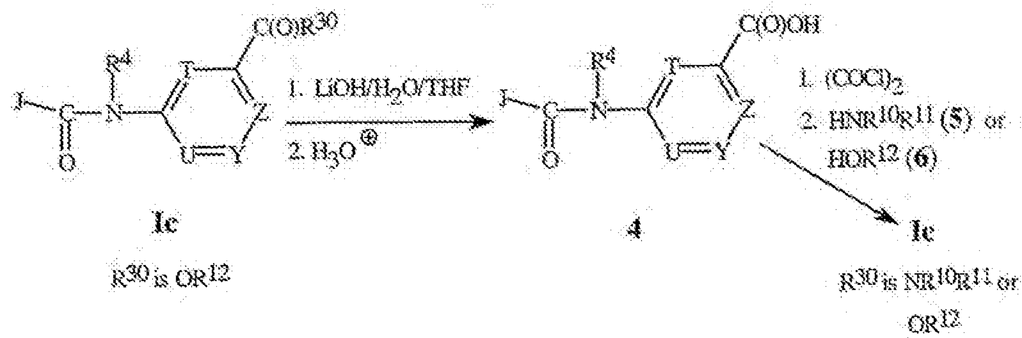
Alternatively, compounds of Formula **Ib** can be directly prepared from the corresponding carboxylic acid of Formula **3** and amino compound of Formula **2** by treatment with $(EtO)_2P(S)SH$ according to the general procedure of N. Borthakur et al., *Tetrahedron Lett.* **1995**, *36*(37), 6745. Also, compounds of Formula **Ia** or **Ib** wherein R^4 is alkyl, alkylcarbonyl, alkoxycarbonyl, alkoxyalkyl or alkylthioalkyl can be prepared from the corresponding compounds of Formula **Ia** or **Ib** wherein R^4 is H by treatment with the appropriate alkylating or acylating reagents in the presence of base using methods well known in the art.

Acyl chlorides of Formula **1** can be prepared from the carboxylic acids of Formula **3** by using methods well known in the art such as treatment with oxalyl chloride and catalytic *N*,*N*-dimethylformamide in dichloromethane or treatment with thionyl chloride. This

preparation is illustrated in Step E of Example 1, Step C of Example 12, Step B of Example 13, Step D of Example 14, and Step E of Example 25.

In some instances compounds of Formula **I** (or **Iz**) can be prepared from other compounds of Formula **I** (or **Iz**). For example, a compound of Formula **Ic** wherein R^{30} is $NR^{10}R^{11}$ or OR^{12} (Formula **I** or **Iz** wherein R^5 is $C(O)NR^{10}R^{11}$ or $C(O)OR^{12}$) can be prepared from the corresponding carboxylic acid of Formula **4**, which is in turn prepared from a compound of Formula **Ic** wherein R^{30} is OR^{12} as shown in Scheme 4.

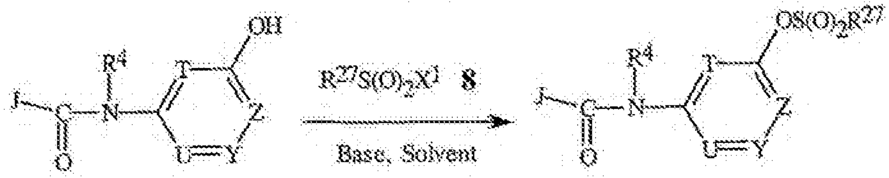
Scheme 4



In this method, the ester compound of Formula **Ic** wherein R^{30} is OR^{12} is converted to the corresponding carboxylic acid of Formula **4** by general procedures well known in the art such as by treatment with aqueous lithium hydroxide in tetrahydrofuran, followed by acidification. The carboxylic acid of Formula **4** is then converted to the corresponding carboxamide of Formula **Ic** wherein R^{30} is $NR^{10}R^{12}$ or ester of Formula **Ic** wherein R^{30} is OR^{12} by amidation or esterification procedures well known in the art. One procedure illustrated in Scheme 4 involves conversion of the carboxylic acid of Formula **4** to an intermediate carbonyl chloride by treatment with oxalyl chloride preferably in the presence of *N,N*-dimethylformamide and an inert solvent such as dichloromethane, and then contacting the intermediate carbonyl chloride with the appropriate amine of Formula **5** or alcohol of Formula **6** to prepare the carboxamide or ester, respectively. As an alternative to preparing the intermediate carbonyl chloride, a dehydrating coupling reagent can be used analogous to the method of Scheme 2. The method of Scheme 4 is illustrated in Examples 2, 3, 5, 6 and 9, Steps A and B of Example 11, and Example 23.

In other instances compounds of Formula **I** (or **Iz**) can be prepared from compounds structurally related to Formula **I** (or **Iz**). For example, as shown in Scheme 5, compounds of Formula **Id** can be prepared from corresponding compounds of Formula **7** by treatment with the corresponding sulfonating reagent of Formula **8** wherein X^1 is a leaving group such as halogen or $OS(O)_2R^{27}$. For reason of cost, X^1 is preferably Cl.

Scheme 5

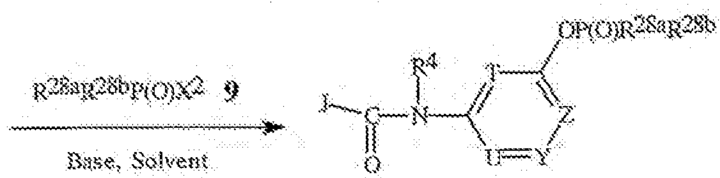


7 Id

The reaction is conducted in the presence of a base such as pyridine, triethylamine or 4-(dimethylamino)pyridine in solvents such as dichloromethane or tetrahydrofuran at temperatures typically between 0 and 70 °C under an inert atmosphere. Compounds of Formula **7** can be prepared by methods analogous to Schemes 1 and 2, starting with the appropriate amino compound analogous to Formula **2** wherein R^5 is replaced by a hydroxy group. Although the hydroxy group can be converted to a protecting group before the reaction with the compound of Formulae **1** or **3** and then deprotected to give the compound of Formula **7**, such protection is generally unnecessary, because the amino group is more reactive than the hydroxy group.

As shown in Scheme 6, compounds of Formula **Ie** can be prepared from corresponding compounds of Formula **7** by treatment with the corresponding phosphorating reagent of Formula **9** wherein X^2 is a leaving group such as halogen. For reason of cost, X^2 is preferably Cl.

Scheme 6



Ie

The reaction is conducted in the presence of a base such as pyridine, triethylamine or 4-(dimethylamino)pyridine in solvents such as dichloromethane or tetrahydrofuran at temperatures typically between 0 and 70 °C under an inert atmosphere.

Compounds of Formula **I** (or **Iz**) can also be prepared from other compounds of Formula **I** (or **Iz**) wherein substituents on the J groups are introduced or elaborated. For example, halogens can be attached using electrophilic addition reactions. Example 21 illustrates the addition of fluorine as R^3 wherein J of Formula **I** (or **Iz**) is J-1.

Carboxylic acids of Formula **3** can be prepared from corresponding esters of Formula **17** wherein R^{31} is a carbon-based radical such as alkyl (e.g., methyl, ethyl), benzyl, etc. as shown in Scheme 7.

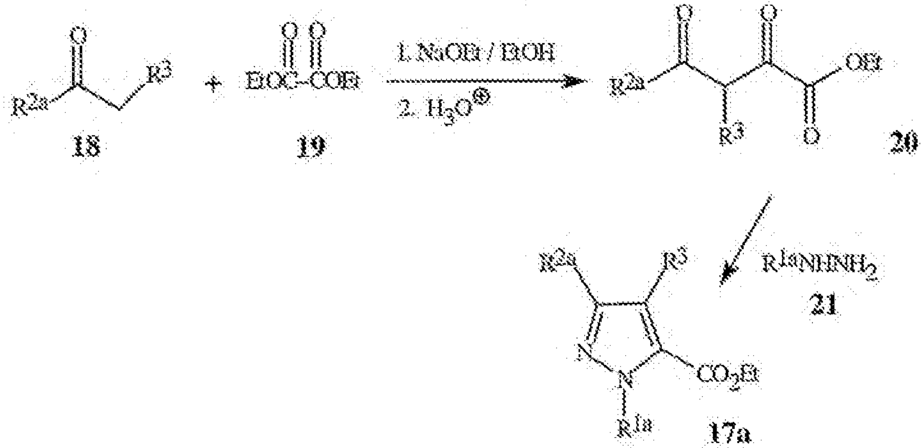
Scheme 7

$$\underset{\mathbf{17}}{\text{J-C(O)OR}^{31}} \xrightarrow{\text{Ester cleavage conditions}} \mathbf{3}$$

A wide range of ester cleavage conditions known in the art can be used for this method. Particularly suitable are conditions involving treatment with hydroxide, such as aqueous sodium hydroxide or aqueous lithium hydroxide in tetrahydrofuran, followed by acidification, typically with a strong mineral acid such as hydrochloric or sulfuric acid. For cleaving esters of Formula **17** wherein R^{31} is benzyl, hydrogenation over palladium catalyst according to general procedures known in the art can be particularly advantageous. The method of Scheme 7 is illustrated in Step D of Example 1, Step B of Example 12, Step A of Example 13, Step C of Example 14, and Step D of Example 22, and Step D of Example 25.

Carboxylic esters of Formula **17a** (Formula **17** wherein J is J-1 and R^{31} is ethyl) can be prepared according to the general method described by J. J. Parlow et al., *J. Org. Chem.* **1997**, *62*, 5908–5919 and modifications thereof as discussed for Scheme 8.

Scheme 8



This method involves base-induced condensation of a ketone of Formula **18** with diethyl oxalate (**19**) to give a tricarbonyl compound of Formula **20**, which is condensed with a hydrazine of Formula **21** to prepare the pyrazolecarboxylate of Formula **17a**. The condensation of the tricarbonyl compound of Formula **20** with the hydrazine of Formula **21** is typically conducted in an alcohol, ester or carbonate diester solvent. The hydrazine of Formula **21** can be in the form of a salt. As a modification of the general method of Scheme 8, when R^3 is H, the diketoester of Formula **20** can be alkylated or fluorinated to provide the corresponding diketoester of Formula **20** wherein R^3 is alkyl or fluorine. The method of Scheme 8 is illustrated in Steps A and B of Example 1 and Steps A and B of Example 25.

As another modification of general method of Scheme 8, when R^{1a} is H, the pyrazolecarboxylate of Formula **17a** can be alkylated with the appropriate alkylating agent in the presence of a base and solvent to give a pyrazolecarboxylate of Formula **17a** wherein R^{1a} is alkyl, fluoroalkyl, alkenyl, fluoroalkenyl, alkynyl or fluoroalkynyl. Appropriate alkylating agents are typically of the formula $R^{1a}X$ (**22**) wherein X is a nucleophilic reaction leaving group (e.g., bromide, iodide, mesylate ($OS(O)_2CH_3$), triflate ($OS(O)_2CF_3$), tosylate ($OS(O)_2Ph\text{-}4\text{-}CH_3$), etc.). Typical bases include potassium *tert*-butoxide, potassium carbonate, sodium hydride and potassium hydroxide. Typical solvents include *N*,*N*-dimethylformamide, acetonitrile and tetrahydrofuran. A particularly useful combination of base and solvent is potassium carbonate in acetonitrile. Alkylation isomers can be separated by common methods such as chromatography and crystallization. This modification is illustrated in Step C of Example 1 and Step C of Example 25.

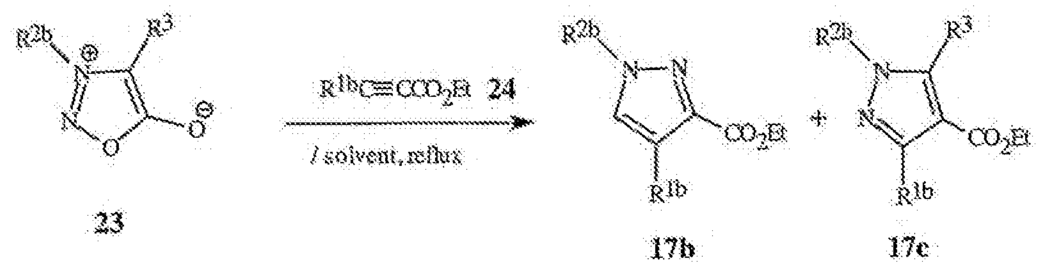
Also, some of the R^{1a} groups can be converted to others on compounds of Formula **17a**. For example, when R^{1a} is 2-hydroxyethyl, treatment with DAST (diethylaminosulfur trifluoride) typically gives a mixture of 2-fluoroethyl and vinyl for R^{1a}. The product compounds of Formula **17a** wherein R^{1a} is 2-fluoroethyl and vinyl can then be separated by methods known in the art such as chromatography on silica gel and crystallization.

Compounds of Formula **18** are commercially available or can be prepared by methods well known in the art. For example, compounds of Formula **18** wherein R^{2a} is $-CR^{20}(OR^{21})(OR^{22})$ can be prepared according to the general procedure described by B. Tellegen, *Recl. Trav. Chim. Pays-Bas* **1938**, *57*, 133–141. Alternate approaches to construct R^{2a} using variations of the process of Scheme 8 are feasible. For example, a compound of Formula **17a** wherein R^{2a} is a 1,1-dimethyl-2-haloethyl group can be prepared by first including R^{2a} in Formula **18** as a 1,1-dimethyl-2-hydroxyethyl group protected as a tetrahydropyranyl ether (e.g., prepared from dihydropyran and pyridinyl *p*-tosylate (PPTS) using the general procedure of M. Miyashita et al., *J. Org. Chem.* **1977**, *142*(23), 3772–3774), and then after preparation of the pyrazole ring according to the process of Scheme 8, deprotecting using PPTS to give the corresponding alcohol, which can then be converted to the mesylate using methanesulfonyl chloride and base, which is then displaced using an appropriate inorganic halide salt in *N*,*N*-dimethylformamide according to the general methods disclosed by P. Sulmon et al., *Organic Preparations and Procedures Int.* **1989**, *21*(1), 91–104 and European Patent EP-25,948-B1. Similarly, substituents can be completed after conducting the processes of other Schemes described herein as an alternative to including the substituents in final form in the starting materials for the processes.

Carboxylic esters of Formula **17b** (Formula **17** wherein J is J-2 and R^{31} is ethyl) and Formula **17c** (Formula **17** wherein J is J-3 and R^{31} is ethyl) wherein R^{1b} is alkyl, fluoroalkyl, alkenyl, fluoroalkenyl, alkynyl or fluoroalkynyl can be prepared from sydnones of Formula **23** and alkynes of Formula **24** according to the general method of *J. Heterocycl. Chem.*

1993, *30*, 365–371 and *J. Heterocycl. Chem.* **1996**, *33*, 719–726 as depicted in Scheme 9. (One skilled in the art recognizes that to prepare **17b** without a substituent at the pyrazole 5-position as specified for Formula **17b** (J-2), the R^3 radical in the sydnone of Formula **23** must be hydrogen.)

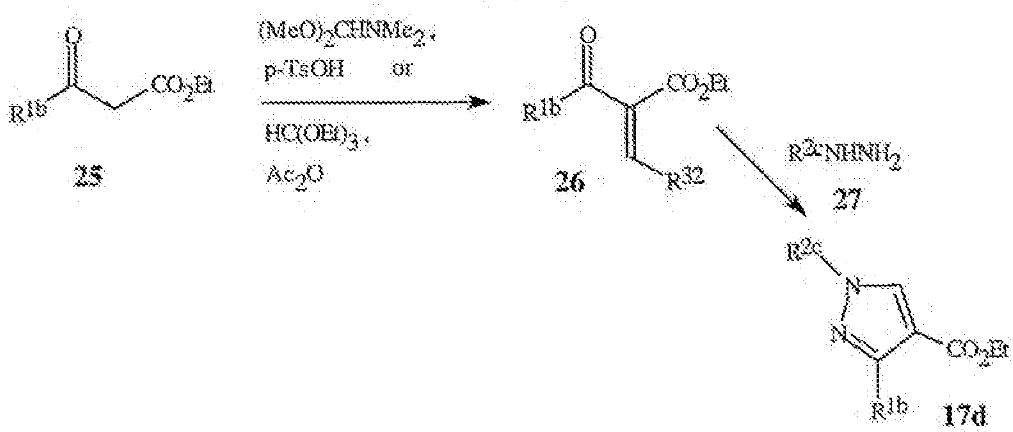
Scheme 9



In this method, sydnones of Formula **23** are heated with alkynes of Formula **24** in higher boiling solvents (e.g., xylenes, toluene, dioxane, ethylene glycol) for typically 12–72 hours. The isomers **17b** and **17c** then can be separated by the usual methods such as column chromatography and distillation. The sydnones of Formula **23** can be prepared using the general methods described in *J. Heterocycl. Chem.* **1993**, *30*, 365–371, *J. Heterocycl. Chem.* **1996**, *33*, 719–726 and the references cited therein. The method of Scheme 9 is illustrated in Step A of Example 12 and Step A of Example 14.

Carboxylic esters of Formula **17d** (Formula **17** wherein J is J-3 but R^{2c} can be H as well as R^{2b}; R^3 is H and R^{31} is ethyl) wherein R^{1b} is alkyl, fluoroalkyl, alkenyl, fluoroalkenyl, alkynyl or fluoroalkynyl can also be prepared according to the method depicted in Scheme 10 wherein R^{32} is NMe_2 or OEt when $(MeO)_2CHNMe_2$ or $HC(OEt)_3$, respectively, is used to prepare intermediate **26**.

Scheme 10



In this method the intermediate of Formula **26** is prepared from the ketoester of Formula **25** according to the general procedures published in *J. Heterocycl. Chem.*, **1987**, *24*, 693–695. The starting ketoesters of Formula **25** can, in turn, be prepared according to the general

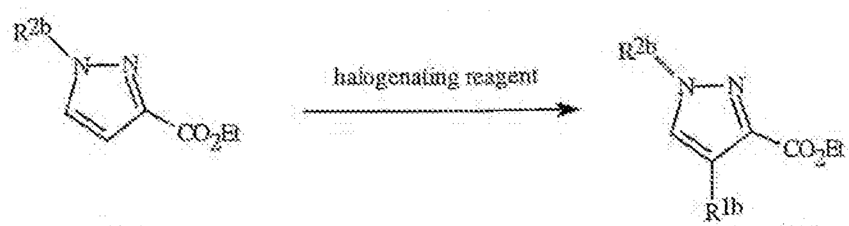
procedures of *J. Org. Chem.* **1997**, *62*, 5908–5919. The condensation of the ketoester of Formula **26** with the hydrazine of Formula **27** is typically conducted in an alcohol, ester or carbonate diester solvent. The hydrazine of Formula **27** can be in the form of a salt.

When R^{2c} is H, the pyrazolecarboxylate of Formula **17d** can be alkylated with the appropriate alkylating agent in the presence of a base and solvent to give a pyrazolecarboxylate of Formula **17d** wherein R^{2c} is R^{2b}. Appropriate alkylating agents are typically of the formula $R^{2b}X$ (**28**) wherein X is a nucleophilic reaction leaving group (e.g., bromide, iodide, mesylate ($OS(O)_2CH_3$), triflate ($OS(O)_2CF_3$), tosylate ($OS(O)_2Ph\text{-}4\text{-}CH_3$), etc.). Typical bases include potassium *tert*-butoxide, potassium carbonate, sodium hydride and potassium hydroxide. Typical solvents include *N,N*-dimethylformamide, acetonitrile and tetrahydrofuran. Alkylation isomers can be separated by common methods such as chromatography and crystallization.

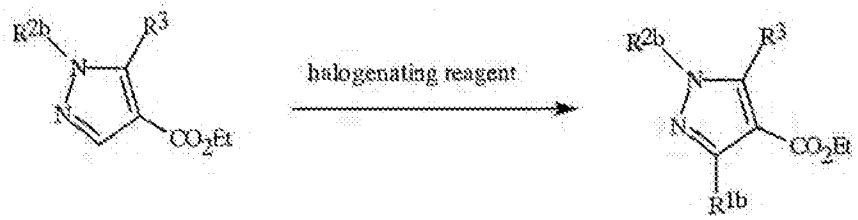
Compounds of Formula **17b** (i.e. pyrazole isomer J-2) can also be prepared using methods or slight modification thereof taught in: *J. Heterocycl. Chem.* **1999**, *36*(1), 217–220, *Agric. Biol. Chem.* **1984**, *48*(1), 45–50, *Bull. Soc. Chim. Fr.* **1978**, (7–8, Pt. 2), 401–14, *Khim. Geterotsikl. Soedin.* **1968**, *4*(4), 685–94, European Patent Application Publication EP 419917 and Spanish Patent ES 493459 (1981). Compounds of Formula **17c** (i.e. pyrazole isomer J-3) can also be prepared using methods or slight modification thereof taught in: *J. Heterocycl. Chem.* **1991**, *28*(6), 1545–7, *J. Heterocycl. Chem.* **1987**, *24*(6), 1669–75, *J. Chem. Res., Synop.* **1986**, (5), 166–7, *Aust. J. Chem.* **1983**, *36*(1), 135–47, Japanese Patent Application Publications JP 01061463, JP 01106866, JP 01061463 and JP 04021671, and Japanese Patents JP 2000212166 and JP 2000044541.

As shown in Scheme 11, pyrazoles of Formulae **17b** and **17c** (wherein R^{1b} is halogen) can be prepared from corresponding pyrazoles of Formula **17e** (Formula **7** wherein J is J-2 but R^{1b} is H; and R^{31} is ethyl) and Formula **17f** (Formula **17** wherein J is J-3 but R^{1b} is H; and R^{31} is ethyl), respectively.

Scheme 11



17e **17b**



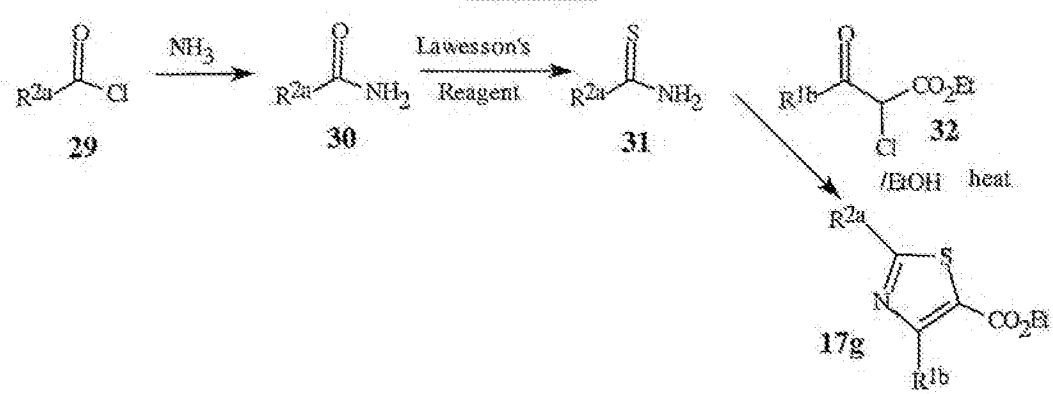
17f **17c**

One variation of method of Scheme 11 involves heating a compound of Formula **17e** or **17f** with *N*-chloro- or *N*-bromosuccinimide in an organic solvent such as *N,N*-dimethylformamide, at temperatures between 30 and 110 °C, preferably at about 60 °C. Alternatively, bromine or chlorine can be added at or below room temperature to a compound of Formula **17e** or **17f** in a halocarbon solvent such as dichloromethane, trichloromethane or tetrachloromethane to give the corresponding compound of Formula **17b** or **17c**, respectively. The method of Scheme 11 is illustrated in Step B of Example 14.

Pyrazoles of Formula **17b** and **17c** wherein R^{1b} is halogen can also be prepared using the general methods taught in: *Bulletin of the Korean Chemical Society* **1998**, *19*(7), 725–726, *Izv. Akad. Nauk SSSR, Ser. Khim.* **1981**, (6), 1342–8, *Izv. Akad. Nauk SSSR, Ser. Khim.* **1980**, (5), 1071–7, *J. Heterocycl. Chem.* **1997**, *34*(2), 537–540, *J. Heterocycl. Chem.* **1991**, *28*(8), 1849–52, *J. Fluorine Chem.* **1988**, *39*(3), 435–40, U.S. Patent No. 5201938, German Patent Application Publication DE 19632945-A1, and Japanese Patent Application Publications JP 10114750, JP 06056793, JP 05339242, JP 05043553, JP 03133961 and JP 01029364.

Thiazolecarboxylates of Formula **17g** (Formula **17** wherein J is J-4) can be prepared as illustrated in Scheme 12.

Scheme 12

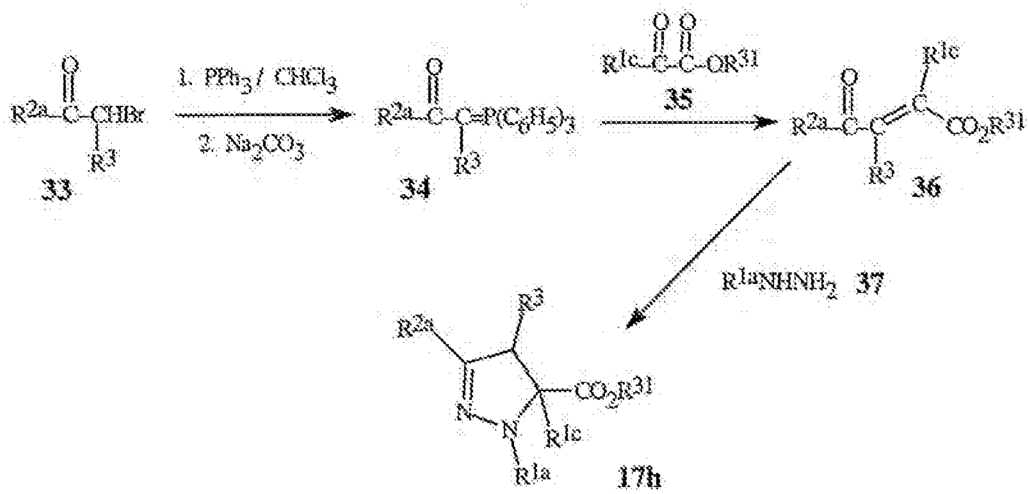


This method starts with an acyl chloride of Formula **29**, which can be prepared by a variety of general methods known in the art; many acyl chlorides of Formula **29** are commercially available. The acyl chloride of Formula **29** is treated with an ammonia solution to prepare the carboxamide of Formula **30**, which is in turn treated with a thionating reagent such as

Lawesson's Reagent (2,4-bis(methoxyphenyl)-1,3-dithia-2,4-diphosphetane-2,4-disulfide) to prepare the thioamide of Formula **31**. The thioamide of Formula **31** is then reacted with the chloro compound of Formula **32** to provide the thiazolecarboxylate of Formula **17g**.

Carboxylic esters of Formula **17h** (Formula **17** wherein J is J-5) can be prepared by the general method shown in Scheme 13.

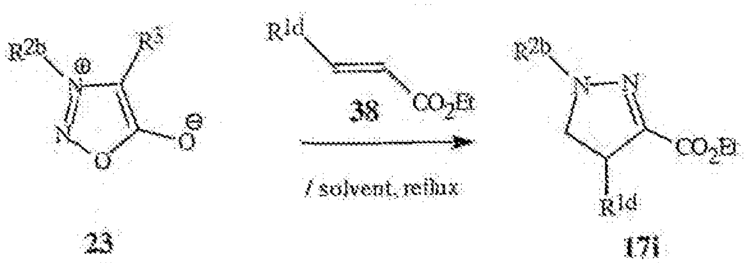
Scheme 13



In this method, an alpha-bromo ketone of Formula **33** is converted to a Wittig reagent of Formula **34** and then condensed with a 2-oxocarboxylic acid ester of Formula **35** to provide a 4-oxo-2-pentenoic ester of Formula **36** according to the general procedure of P. F. Schuda et al., *Synthesis* **1987** (12), 1055–7. The 4-oxo-2-pentenoic ester of Formula **36** is then condensed with a hydrazine of Formula **37** to form the carboxylic ester of Formula **17h** according to the general procedures of G. Westphal & H. H. Stroh, *Liebigs Ann. Chem.* **1968**, *716*, 160–163 and R. C. Moreau & P. Loiseau, *Annales Pharmaceutiques Francaises* **1978**, *36* (1–2), 67–75. This method is illustrated by Steps A through C of Example 22.

Carboxylic esters of Formula **17i** (Formula **17** wherein J is J-6 and R^{31} is ethyl) wherein R^{1d} is H, alkyl, fluoroalkyl, alkenyl, fluoroalkenyl, alkynyl or fluoroalkynyl can be prepared from sydnones of Formula **23** and alkenes of Formula **38** according to the general methods described in Z. *Obshch. Khim.* **1962**, *32*(5), 1446–1451 as depicted in Scheme 14.

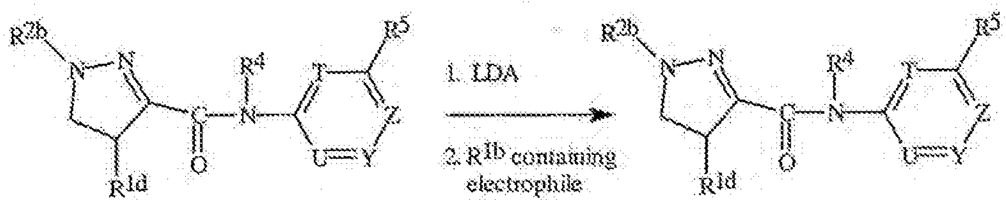
Scheme 14



In this method, sydnones of Formula **23** are heated with alkenes of Formula **38** in higher boiling solvents (e.g., xylenes, toluene, dioxane, ethylene glycol) for typically 12–72 hours. The isomer **17i** can then be isolated by the usual methods such as column chromatography and distillation.

The ester of Formula **17i** can then be converted to the corresponding carboxylic acid as described for Scheme 7 and coupled to form the compound of Formula **Ia** as described for Schemes 1 and 2. Most R^{1b} substituents can be introduced as R^{1d} in the method of Scheme 14, but halogen cannot. Halogen as well as other R^{1b} substituents can be introduced in the method shown in Scheme 15.

<u>Scheme 15</u>

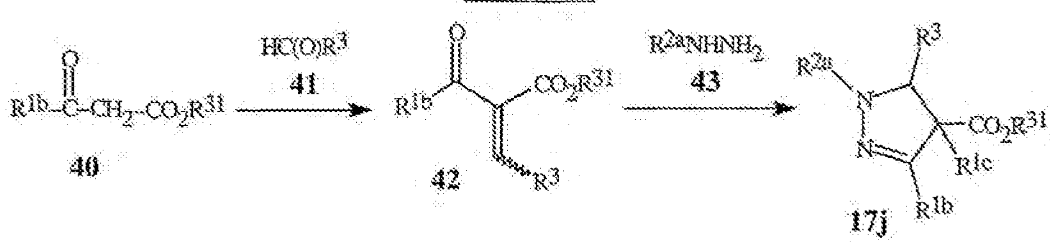


If (R^{1d} is H) **If** (R^{1d} is R^{1b})

In this method, the compound of Formula **If** wherein R^{1d} is R^{1b} is prepared from the compound of Formula **If** wherein R^{1d} is H. The compound of Formula **If** wherein R^{1d} is H is then deprotonated using a strong base such as lithium diisopropylamide (LDA) and then reacted with an electrophile introducing R^{1b}. This general method is discussed by T. M. Stevenson et al., "1-Arylpyrazoline-3-carboxanilides" in *Synthesis and Chemistry of Agrochemicals IV* (D. R. Baker et al., Eds., American Chemical Society, Washington, D.C., 1995) Chapter 26, pp. 291–299. For halogenation, the electrophile can be elemental halogen (e.g., Cl_2, Br_2) or a halogen derivative such as *N*-bromosuccinimide or *N*-chlorosuccinimide. When R^{1b} is alkyl, fluoroalkyl, alkenyl, fluoroalkenyl, alkynyl or fluoroalkynyl the electrophile is typically of the formula $R^{1b}X$ (**39**) wherein X is a nucleophic reaction leaving group as already described for the compound of Formula **22** in connection with the modified method of Scheme 8.

Carboxylic esters of Formula **17j** (Formula **17** wherein J is J-7) wherein R^{1c} is H can be prepared by the general method shown in Scheme 16.

<u>Scheme 16</u>

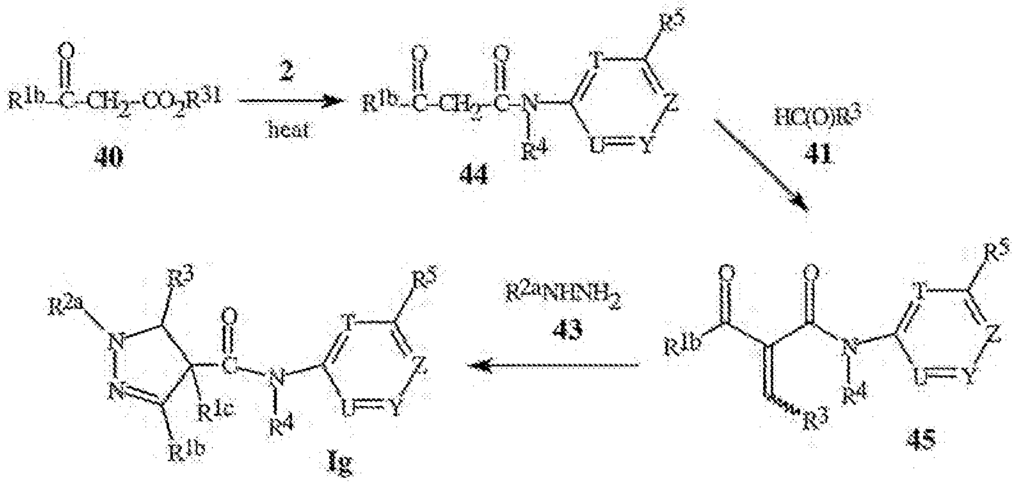


40 **42** **17j**

In this method, a 3-oxo-carboxylic acid ester of Formula **40** is condensed with an aldehyde of Formula **41** to provide an unsaturated ester of Formula **42**, which is condensed with a hydrazine of Formula **43** to provide the carboxylic ester of Formula **17j** according to the general procedure of P. S. Engel et al., *J. Am. Chem. Soc.* **1997**, *119* (26), 6059–6065.

The ester of Formula **17j** can then be converted to the corresponding carboxylic acid as described for Scheme 7 and coupled to form the compound of Formula **Ia** as described for Schemes 1 and 2. Alternatively as shown in Scheme 17, the coupling can be conducted first to prepare the amide of Formula **44**, which is then condensed with the aldehyde of Formula **41** to prepare the unsaturated amide of Formula **45**, which is condensed with the hydrazine of Formula **43** to prepare the compound of Formula **Ig** wherein R^{1c} is H.

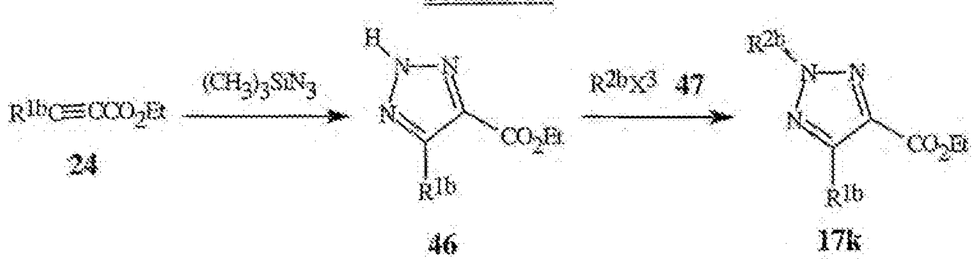
Scheme 17



The method of Scheme 17 is illustrated in Steps A and B of Example 24.

Carboxylic esters of Formula **17k** (Formula **17** wherein J is J-8) can be prepared by the general method shown in Scheme 18.

Scheme 18



In this method, an alkynecarboxylic acid ester of Formula **24** is heated with an excess of azidotrimethylsilane at a temperature of about 100–110 °C under an inert atomosphere. The reaction is worked up by treating the cooled reaction mixture with excess methanol to consume remaining trimethylsilyl azide and desilylate the azide adduct. Evaporation leaves the 1,2,3-triazole of Formula **46**. These conditions are described by R. S. Klein et al., *J.*

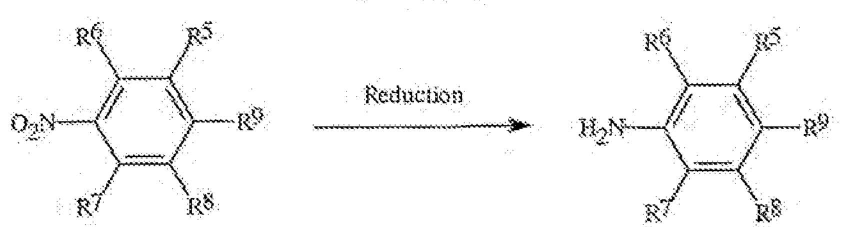
Heterocycl. Chem. **1976**, *13*, 589–592 and illustrated by Step A of Example 26. The triazole of Formula **46** is then converted to the triazole of Formula **17k** by alkylation with $R^{2b}X^3$ (**47**) wherein X^3 is a nucleophilic reaction leaving group such as Cl, Br, I, sulfonates such as *p*-toluenesulfonate, methanesulfonate or trifluoromethanesulfonate, or sulfates such as $-OSO_2OR^{2b}$. Preferably, X^3 is a strong leaving groups such as I. The reaction is conducted in the presence of a base such as potassium carbonate in a polar aprotic solvent such as acetonitrile at a temperature commonly between 40 and 80 °C, typically about 50–60 °C. Filtration to remove solid byproducts and evaporation of the solvent leaves a crude product containing the triazole of Formula **17k** typically together with other alkylation regioisomers. The triazole of Formula **17k** can be isolated and purified by the usual methods known to those skilled in the art such as chromatography and crystallization. This method is illustrated by Step B of Example 26.

When R^{2b} is a tertiary alkyl group such as *tert*-butyl, alkylation with $R^{2b}X^3$ may give low yields. Compounds of Formula **17k** wherein R^{2b} is a tertiary alkyl group can be satisfactorily prepared from compounds of Formula **46** by reaction with the appropriate alcohol $R^{2b}OH$ (**47**) in trifluoroacetic acid solution in the presence of concentrated sulfuric acid according to the general procedure of J. W. Tilley et al., *J. Med Chem.* **1991**, *34*(3), 1125–1134. This method is illustrated by Step A of Example 28.

Although ethyl esters are shown for the compounds of Formulae **24**, **46** and **17k**, one skilled in the art recognizes that corresponding esters wherein ethyl is replaced by other carbon-based radicals, e.g., R^{31}, can be used as well for this method. Also known in the art are other methods to prepare 1,2,3-triazole rings, such as those described in PCT Patent Publication WO 02/096258.

Amino compounds of Formula **2** can be prepared by a wide variety of methods available to the synthetic organic chemist. Many of these methods involve converting one substituent to another on the aromatic ring. For example, the amino function of Formula **2a** (Formula **2** wherein R^4 is H, T is CR^6, U is CR^7, Y is CR^8 and Z is CR^9) can be obtained by reduction of the nitro compound of Formula **60** as shown in Scheme 19.

Scheme 19



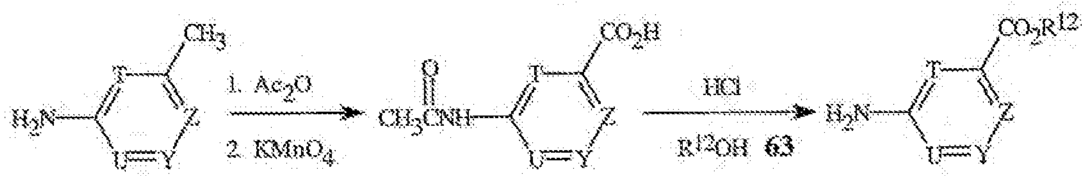
60 **2a**

The nitro compound of Formula **60** can be reduced to the aniline of Formula **2a** by a variety of reducing agents known in the art, such as iron in acetic acid, tin(II) chloride or

hydrogenation over a palladium or platinum sulfide catalyst. The nitro function of Formula **60** can be added by well known nitration reactions. The method of Scheme 19 is illustrated in Step B of Example 4, Step C of Example 7, Step B of Example 16 and Step B of Example 17. Many compounds of Formula **60** are commercially available. When T, U and/or Z are N, the aryl ring of Formula **2** is activated to nucleophilic substitution facilitating introduction of amino by displacement of leaving groups such as halogen.

As another example of conversion of one substituent to another, compounds of Formula **2b** (Formula **2** wherein R^4 is H and R^5 is CO_2R^{12}) wherein T is CR^6 or N; U is CR^7 or N; Y is CR^8 or N; Z is CR^9 or N; R^6, R^7, R^8 and R^9 are each independently H or F; and R^{12} is C_1–C_5 alkyl, C_2–C_5 haloalkyl, C_3–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl or C_4–C_5 cycloalkylalkyl can be prepared as shown in Scheme 20.

Scheme 20



61 **62** **2b**

In the method of Scheme 20, the amino function of a compound of Formula **61** is protected as the acetamide by treatment with acetic anhydride. Treatment with potassium permanganate then oxidizes the aromatic methyl radical to a carboxylic acid function to provide the compound of Formula **62**. The compound of Formula **62** is then treated with strong acid, such as hydrochloric acid and alcohol of Formula **63** to form the ester group and deprotect the amino radical. This method works particularly well for short aliphatic alcohols (e.g., R^{12} is Me or Et). The method of Scheme 20 is illustrated in Steps A through C of Example 8 and Steps A through C of Example 10. Other synthetic approaches to prepare compounds of Formula **2b** are also feasible, as is illustrated by Steps A through C of Example 19. Compounds of Formula **2b** wherein R^{12} is methyl or ethyl can be coupled to form compounds of Formula **Ia** wherein R^4 is H and R^5 is CO_2R^{12} according to the methods of Schemes 1 and 2, and then R^{12} converted to other radicals or CO_2R^{12} converted to other groups such $C(O)NR^{10}R^{11}$ according to the method of Scheme 4 and other methods known to those skilled in the art. This conversion is illustrated by Example 20.

As still another example of conversion of one substituent to another, amides of Formula **2** wherein R^5 is $C(O)NR^{10}R^{11}$ can be converted to thioamides of Formula **2** wherein R^5 is $C(S)NR^{10}R^{11}$ using the thionating reagents already described for the method of Scheme 3.

It is recognized that some reagents and reaction conditions described above for preparing compounds of Formula **I** or **Iz** may not be compatible with certain functionalities present in the intermediates. In these instances, the incorporation of protection/deprotection sequences or functional group interconversions into the synthesis will aid in obtaining the desired products. The use and choice of the protecting groups will be apparent to one skilled in chemical synthesis (see, for example, T. W. Greene, P. G. M. Wuts, *Protective Groups in Organic Synthesis*, 2nd ed.; Wiley: New York, 1991). One skilled in the art will recognize that, in some cases, after the introduction of a given reagent as it is depicted in any individual scheme, it may be necessary to perform additional routine synthetic steps not described in detail to complete the synthesis of compounds of Formula **I** or **Iz**. One skilled in the art will also recognize that it may be necessary to perform a combination of the steps illustrated in the above schemes in an order other than that implied by the particular sequence presented to prepare the compounds of Formula **I** or **Iz**.

One skilled in the art will also recognize that compounds of Formula **I** (or **Iz**) and the intermediates described herein can be subjected to various electrophilic, nucleophilic, radical, organometallic, oxidation, and reduction reactions to add substituents or modify existing substituents.

Without further elaboration, it is believed that one skilled in the art using the preceding description can utilize the present invention to its fullest extent. The following Examples are, therefore, to be construed as merely illustrative, and not limiting of the disclosure in any way whatsoever. Percentages are by weight except for chromatographic solvent mixtures or where otherwise indicated. Parts and percentages for chromatographic solvent mixtures are by volume unless otherwise indicated. ^{1}H NMR spectra are reported in ppm downfield from tetramethylsilane; ^{19}F NMR spectra are reported in ppm relative to CF_3CCl_3; "s" means singlet, "d" means doublet, "t" means triplet, "q" means quartet, "m" means multiplet, "dd" means doublet of doublets, "dt" means doublet of triplets, "dq" means doublet of quartets, "br s" means broad singlet, "br d" means broad doublet.

EXAMPLE 1

Preparation of ethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino]benzoate (Compound 80)

<u>Step A: Preparation of ethyl 2-hydroxy-5,5-dimethyl-4-oxo-2-hexenoate</u>

To a solution of sodium ethoxide in ethanol (250 mL, 21% by weight in ethanol, 670 mmol) was added dropwise a solution of diethyl oxalate (45.2 mL, 332.5 mmol) and pinacolone (alternatively named 3,3-dimethyl-2-butanone) (41.7 mL) in ethanol (300 mL) at room temperature under nitrogen atmosphere. The reaction mixture was stirred at room temperature overnight, concentrated to its half volume and poured into ice. Concentrated hydrochloric acid was added to lower the pH to approximately 4, and then the mixture was

extracted with ethyl acetate. The extracts were dried over magnesium sulfate and concentrated to give the title compound as an oil (60 g, yield 90%).

Step B: Preparation of ethyl 5-(1,1-dimethylethyl)-1*H*-pyrazole-3-carboxylate

To a solution of ethyl 2-hydroxy-5,5-dimethyl-4-oxo-2-hexenoate (i.e. the product of Step A) (45.3 g, 226 mmol) in ethanol (200 mL) and acetic acid (2 mL) was added hydrazine monohydrate (12.1 mL, 249 mmol) dropwise under nitrogen atmosphere at room temperature. The reaction mixture was stirred at room temperature overnight and concentrated to give 40.8 g of the title compound.

^{1}H NMR ($CDCl_3$) δ 6.7 (s, 1H), 6.60 (br s, 1H), 4.40 (q, 2H), 1.40 (t, 3H), 1.32 (s, 9H).

Step C: Preparation of ethyl 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxylate

To a solution of ethyl 5-(1,1-dimethylethyl)-1*H*-pyrazole-3-carboxylate (i.e. the product of Step B) (20.0 g, 102 mmol) in anhydrous *N,N*-dimethylformamide (DMF) (100 mL) was added sequentially potassium carbonate (28.2 g, 204 mmol) and iodoethane (11.4 mL, 143 mmol) at room temperature. After stirring at room temperature in an inert atmosphere for 6 h, the reaction mixture was diluted with ethyl acetate (400 mL) and washed with water (2x50 mL). The organic phase was separated, dried and concentrated. The residue was purified by chromatography on silica gel to give the desired isomer (i.e. the title compound) as a white solid (13.8 g, 64% yield) and a minor isomer (2.1 g, 10% yield).

^{1}H NMR ($CDCl_3$) δ 6.7 (s, 1H), 4.55 (q, 2H), 4.32 (q, 2H), 1.40 (m, 6H), 1.32 (s, 9H).

^{1}H NMR ($CDCl_3$) (minor isomer) δ 6.7 (s, 1H), 4.20 (q, 2H), 4.30 (q, 2H), 1.36 (m, 6H), 1.32 (s, 9H).

Step D: Preparation of 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxylic acid

A solution of ethyl 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxylate (i.e. the product of Step C) (6.9 g, 30.8 mmol) in ethanol (200 mL) was stirred with an aqueous solution of sodium hydroxide (10%, 19 mL) at room temperature for 6 h. The mixture was then concentrated and acidified with 1 N hydrochloric acid. The precipitated solids were filtered and dried to give 6 g of the title acid as a white solid.

^{1}H NMR ($CDCl_3$) δ 10.00 (s, 1H), 6.80 (s, 1H), 4.60 (q, 2H), 1.40 (t, 3H), 1.32 (s, 9H).

Step E: Preparation of 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carbonyl chloride

A solution of 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxylic acid (i.e. the product of Step D) (1.2 g, 6.11 mmol) and oxalyl chloride (2 mL) in dichloromethane (30 mL) in the presence of anhydrous DMF (0.1 mL) was stirred under nitrogen atmosphere at room temperature for 4 h. The reaction mixture was then concentrated to yield the title acid chloride as a liquid.

Step F: Preparation of ethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]-carbonyl]amino]benzoate

A solution of 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carbonyl chloride (i.e. the product of Step E) (1.3 g) in dichloromethane (30 mL) was added to a solution of ethyl 3-aminobenzoate (1.21 g) in dichloromethane (10 mL) in the presence of triethylamine (2 mL) and 4-(dimethylamino)pyridine (DMAP) (0.1 g). After stirring at room temperature overnight the reaction mixture was diluted with dichloromethane (50 mL) and washed with 1 N hydrochloric acid. The organic phase was separated, dried ($MgSO_4$) and concentrated. The residue was purified by chromatography on silica gel to give the title compound (1.7 g, 81% yield), a compound of present invention, as a solid.

^{1}H NMR ($CDCl_3$) δ 8.01 (m, 2H), 7.80 (d, 1H), 7.42 (t, 1H), 6.53 (s, 1H), 4.57 (q, 2H), 4.38 (q, 2H), 1.38 (m, 6H), 1.34 (s, 9H).

EXAMPLE 2

Preparation of 2-fluoroethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]-carbonyl]amino]benzoate (Compound 82)

Step A: Preparation of 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino]benzoic acid

A solution of ethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino]benzoate (i.e. the product of Example 1, Step F) (4.8 g, 14 mmol) in methanol (30 mL) was stirred with an aqueous solution of sodium hydroxide (10%, 17 mL) at room temperature for 6 h. The reaction mixture was then concentrated and acidified with 1 N hydrochloric acid. The precipitated solids were filtered and dried to give the title acid as a white solid (4.3 g).

^{1}H NMR ($CDCl_3$) δ 10.6 (s, 1H), 8.38 (s, 1H), 8.00 (d, 1H), 7.62 (d, 1H), 7.40 (t, 1H), 4.47 (q, 2H), 1.34 (t, 3H), 1.20 (s, 9H).

Step B: Preparation of 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino]benzoyl chloride

A solution of the 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-benzoic acid (i.e. the product of Step A) (1.2 g, 3.80 mmol), oxalyl chloride (1.72 mL) and anhydrous DMF (0.1 mL) in dichloromethane (10 mL) was stirred under nitrogen atmosphere at room temperature for 4 h. The reaction mixture was then concentrated to yield the title acid chloride.

Step C: Preparation of 2-fluoroethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]benzoate

To a solution of the 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino]benzoyl chloride (i.e. the product of Step B) (0.2 g) in dichloromethane (5 mL) was

added a solution of 2-fluoroethanol (0.1 mL), triethylamine (0.2 mL) and DMAP (20 mg) under nitrogen atmosphere at room temperature. After stirring at room temperature for 6 h, the reaction mixture was diluted with dichloromethane (15 mL) and washed with 1 N hydrochloric acid (5 mL). The organic phase was dried and concentrated. The residue was purified by chromatography on silica gel to give the title compound (155 mg), a compound of present invention.

^{1}H NMR ($CDCl_3$) δ 8.05 (m, 1H), 7.88 (d, 1H), 7.70 (br s, 1H, NH), 7.42 (t, 1H), 6.50 (s, 1H), 4.60 (m, 6H), 1.42 (t, 3H), 1.34 (s, 9H).

EXAMPLE 3

Preparation of 3-(1,1-dimethylethyl)-1-ethyl-*N*-[3-[[(2,2,2-trifluoroethyl)amino]carbonyl]-phenyl]-1*H*-pyrazole-5-carboxamide (Compound 43)

To a solution of 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-benzoyl chloride (i.e. the product of Example 2, Step B) (0.2 g) in dichloromethane (5 mL) was added sequentially 2,2,2-trifluoroethylamine (0.1 mL), triethylamine (0.2 mL) and DMAP (20 mg) at room temperature. After stirring at room temperature for 6 h, the reaction mixture was diluted with dichloromethane (15 mL) and washed with hydrochloric acid (1 N, 5 mL). The organic phase was separated, dried and concentrated. The residue was purified by chromatography on silica gel to give the title compound (155 mg), a compound of present invention.

^{1}H NMR ($CDCl_3$) δ 7.44 (m, 3H), 7.12 (dd, 1H), 6.76 (s, 1H), 6.42 (s, 1H, NH), 4.60 (q, 2H), 4.12 (m, 2H), 1.42 (t, 3H), 1.38 (s, 9H).

EXAMPLE 4

Preparation of ethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino-4-fluorobenzoate (Compound 70)

Step A: Preparation of ethyl 4-fluoro-3-nitrobenzoate

A mixture of 4-fluoro-3-nitrobenzoic acid (10 g, 54 mmol), diethyl sulfate (8.5 mL) and potassium carbonate (10 g) in anhydrous acetone (120 mL) was heated to reflux for 6 h. The reaction mixture was then filtered, and the filtrate was concentrated. The residue was purified by chromatography on silica gel to give the title compound (11.2 g) as a yellow oil.

^{1}H NMR ($CDCl_3$) δ 8.64 (dd, 1H), 8.32 (m, 1H), 7.38 (t, 1H), 4.44 (q, 2H), 1.40 (t, 3H).

Step B: Preparation of ethyl 3-amino-4-fluorobenzoate

A solution of ethyl 4-fluoro-3-nitrobenzoate (the product of Step A) (5.7 g, 26.7 mmol) in acetic acid (50 mL) and ethyl acetate (60 mL) was added dropwise over 20 minutes to a suspension of iron powder (6.0 g) in acetic acid (5% wt, 30 mL) at 80 °C. After the addition, the reaction mixture was stirred at 80 °C for additional 20 minutes. The mixture was then cooled to room temperature. Solids were removed by filteration through

Celite® diatomaceous filter aid, and the filtrate was concentrated. The residue was diluted with ethyl acetate (100 mL) and washed sequentially with water (25 mL) and aqueous sodium bicarbonate solution (5%, 25 mL). The organic layer was dried and concentrated to give the title compound (4.5 g).

^{1}H NMR ($CDCl_3$) δ 7.60 (dd, 1H), 7.42 (m, 1H), 7.08 (t, 1H), 4.34 (q, 2H), 3.90 (br s, 2H), 1.34 (t, 3H).

Step C: Preparation of ethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]-carbonyl]amino-4-fluorobenzoate

A solution of 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carbonyl chloride (i.e. the product of Example 1, Step E) (4.7 g) in dichloromethane (40 mL) was added to a solution of ethyl 3-amino-4-fluorobenzoate (i.e. the product of Step B) (4.46 g, 24.3 mmol) and *N*,*N*-diisopropylethylamine (8.5 mL) in dichloromethane (10 mL). After stirring at room temperature overnight, the reaction mixture was diluted with dichloromethane (100 mL) and washed with 1 N hydrochloric acid. The organic phase was separated, dried and concentrated. The residue was purified by chromatography on silica gel to give the title compound (6.6 g), a compound of the present invention.

^{1}H NMR ($CDCl_3$) δ 8.14 (m, 1H), 8.00 (dd, 1H), 7.26 (s, 1H), 6.26 (s, 1H), 4.34 (m, 4H), 1.41 (m, 6H), 1.20 (s, 9H).

EXAMPLE 5

Preparation of 3-(1,1-dimethylethyl)-1-ethyl-*N*-[5-[(ethylamino)carbonyl]-2-fluorophenyl]-1*H*-pyrazole-5-carboxamide (Compound 2)

Step A: Preparation of 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino]-4-fluorobenzoic acid

A solution of ethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino-4-fluorobenzoate (i.e. the product of Example 4, Step C) (6.6 g, 18.3 mmol) in methanol (40 mL) and aqueous sodium hydroxide (10%, 17 mL) was stirred at room temperature for 6 h. The reaction mixture was then concentrated and acidified with 1 N hydrochloric acid. The precipitated solids were filtered and dried to give 5.3 g of the title acid as a white solid.

^{1}H NMR (DMSO-d_6) δ 10.54 (s, 1H), 8.22 (dd, 1H), 7.86 (m, 1H), 7.40 (t, 1H), 6.89 (s, 1H), 4.44 (q, 2H), 1.32 (t, 3H), 1.30 (s, 9H).

Step B: Preparation of 3-(1,1-dimethylethyl)-1-ethyl-*N*-[5-[(ethylamino)carbonyl]-2-fluorophenyl]-1*H*-pyrazole-5-carboxamide

To a solution of 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-4-fluorobenzoic acid (i.e. the product of Step A) (200 mg) in dichloromethane (5 mL) was added sequentially 1-propanephosphonic acid cyclic anhydride (50% in ethyl acetate, 4 mL),

ethylamine (0.3 mL) and DMAP (0.2 g) at room temperature. After stirring at room temperature overnight, the reaction mixture was diluted with dichloromethane (10 mL) and washed with 1 N hydrochloric acid (5 mL). The organic phase was separated, dried and concentrated. The residue was purified by chromatography on silica gel to give the title compound, a compound of present invention, as white solid, m.p. 188.5 °C.

EXAMPLE 6

Alternate Preparation of 3-(1,1-dimethylethyl)-1-ethyl-*N*-[5-[(ethylamino)carbonyl]-2-fluorophenyl]-1*H*-pyrazole-5-carboxamide (Compound 2)

To a solution of 3-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-4-fluorobenzoic acid (i.e. the product of Example 5, Step A) (200 mg) in dichloromethane (5 mL) was added oxalyl chloride (0.5 mL) and anhydrous DMF (0.1 mL). After stirring at room temperature for 2 h, the reaction mixture was concentrated under reduced pressure. To a solution of the residue (200 mg) in dichloromethane (5 mL) at room temperature was added sequentially ethylamine (0.3 mL), triethylamine (0.5 ml) and DMAP (0.1 g). After stirring at room temperature for 6 h, the reaction mixture was diluted with dichloromethane (10 mL) and washed with hydrochloric acid (1 N, 5 mL). The organic phase was separated, dried and concentrated. The residue was purified by chromatography on silica gel to give the title compound, a compound of present invention, as white solid, m.p. 188.5 °C.

EXAMPLE 7

Preparation of *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide (Compound 6)

Step A: Preparation of 4-fluoro-3-nitrobenzoyl chloride

A solution of 4-fluoro-3-nitrobenzoic acid (13 g, 70 mmol), oxalyl chloride (8.5 mL) and DMF (0.5 mL) in anhydrous dichloromethane (200 mL) was stirred at room temperature under nitrogen atmosphere for 2 h. The reaction mixture was then concentrated to remove the solvent, and the crude title compound was used for the next reaction without further purification (13 g).

Step B: Preparation of 4-fluoro-*N*,*N*-dimethyl-3-nitrobenzamide

To a solution of 4-fluoro-3-nitrobenzoyl chloride (i.e. the product of Step A) (4.1 g) in dichloromethane (50 mL) was added dimethylamine hydrochloride (2.13 g) and *N*,*N*-diisopropylethylamine (4 mL) at room temperature. After stirring at room temperature for 6 h, the reaction mixture was diluted with dichloromethane (100 mL) and washed with 1 N hydrochloric acid (15 mL). The organic phase was separated, dried and concentrated. The residue was purified by chromatography on silica gel to give the title compound (3.4 g) as white solid.

Step C: Preparation of 3-amino-4-fluoro-*N*,*N*-dimethylbenzamide

A solution of 4-fluoro-*N*,*N*-dimethyl-3-nitrobenzamide (i.e. the product of Step B) (1.8 g, 8.5 mmol) in acetic acid (9 mL) and ethyl acetate (10 mL) was added dropwise over 20 minutes to a suspension of iron powder (1.5 g) in acetic acid (5%, 5 mL) at 80 °C. After the addition, the reaction mixture was stirred at 80 °C for additional 20 minutes. The mixture was then cooled to room temperature. Solids were removed by filteration through Celite® diatomaceous filter aid, and the filtrate was concentrated. The residue was diluted with ethyl acetate (50 mL) and washed sequentially with water (10 mL) and aqueous sodium bicarbonate solution (5%, 15 mL). The organic layer was dried and concentrated to give the title compound (1.1 g).

Step D: Preparation of *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide

A solution of 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carbonyl chloride (i.e. the product of Example 1, Step E) (1.2 g) in dichloromethane (10 mL) was added to a solution of 3-amino-4-fluoro-*N*,*N*-dimethylbenzamide (i.e. the product of Step C) (1.1 g) and *N*,*N*-diisopropylethylamine (2.5 mL) in dichloromethane (5 mL). After stirring at room temperature for 6 h, the reaction mixture was diluted with dichloromethane (20 mL) and washed with 1 N hydrochloric acid. The organic phase was separated, dried and concentrated. The residue was purified by chromatography on silica gel to give the title compound (1.8 g), a compound of present invention.

^{1}H NMR ($CDCl_3$) δ 8.40 (dd, 1H), 8.02 (br s, 1H, NH), 7.22 (m, 2H), 6.54 (s, 1H), 4.58 (q, 2H), 3.10 (s, 3H), 3.03 (s, 3H), 1.44 (t, 3H), 1.34 (s, 9H).

EXAMPLE 8

Preparation of methyl 6-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-2-pyridinecarboxylate (Compound 143)

Step A: Preparation of *N*-(6-methyl-2-pyridinyl)acetamide

A solution of 2-amino-6-picoline (20 g, 185 mmol) and acetic anhydride (35 mL) in anhydrous tetrahydrofuran (THF) (150 mL) was heated at reflux for 10 h. The reaction mixture was then cooled to room temperature and concentrated to leave a thick oily residue. The residue was dissolved in dichloromethane (400 mL) and washed sequentially with hydrochloric acid (1 N, 50 mL) and water (50 mL). The organic phase was dried and concentrated to give the title compound as a white solid (27.6 g, 99% yield).

^{1}H NMR ($CDCl_3$) δ 8.02 (d, 1H), 8.00 (br s, 1H, NH), 7.61 (t, 1H), 6.90 (d, 1H), 2.44 (s, 3H), 2.20 (s, 3H).

Step B: Preparation of 6-(acetylamino)-2-pyridinecarboxylic acid

To a suspension of *N*-(6-methyl-2-pyridinyl)acetamide (i.e. the product of Step A) (27 g, 184 mmol) in water (250 mL) at 90 °C was added potassium permanganate (29.1 g, 184 mmol) in small portions. After the addition, the mixture was heated to 90 °C for 6 h. The mixture was then cooled and filtered through a pad of Celite® diatomaceous filter aid. The filtrate was concentrated to half of its volume and acidified with concentrated hydrochloric acid. The precipitated solids were isolated by filtration and dried to give 20 g of the title compound.

Step C: Preparation of methyl 6-amino-2-pyridinecarboxylate

Hydrogen chloride gas was bubbled through a suspension of 6-(acetylamino)-2-pyridinecarboxylic acid (i.e. the product of Step B) (20 g) in methanol (100 mL) for 1 h. The reaction mixture was then heated to reflux overnight. Concentration followed by purification on silica gel column provided the title compound (12 g).

^{1}H NMR ($CDCl_3$) δ 7.52 (m, 2H), 6.69 (d, 1H), 4.80 (br s, 2H, NH2), 3.96 (s, 3H).

Step D: Preparation of methyl 6-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]-carbonyl]amino]-2-pyridinecarboxylate

To a solution of 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carbonyl chloride (i.e. the product of Example 1, Step E) (1.2 g) in dichloromethane (10 mL) was added sequentially a solution of methyl 6-amino-2-pyridinecarboxylate (i.e. the product of Step C) (1.03 g) in dichloromethane (5 mL) followed by triethylamine (2 mL) and then DMAP (0.1 g). After stirring at room temperature for 6 h, the reaction mixture was diluted with dichloromethane (20 mL) and washed with 1 N hydrochloric acid. The organic phase was separated, dried and concentrated. The residue was purified by chromatography on silica gel to give the title compound (1.24 g), a compound of the present invention.

^{1}H NMR ($CDCl_3$) δ 8.72 (s, 1H, NH), 8.42 (m, 1H), 7.82 (d, 2H), 6.64 (s, 1H), 4.48 (q, 2H), 4.01 (s, 3H), 1.45 (t, 3H), 1.31 (s, 9H).

EXAMPLE 9

Preparation of 6-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-2-pyridinecarboxamide (Compound 162)

Step A: Preparation of 6-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino-2-pyridinecarboxylic acid

A solution of methyl 6-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino]-2-pyridinecarboxylate (i.e. the product of Example 8, Step D) (1.02 g, 3.09 mmol) in methanol (50 mL) was stirred at room temperature with an aqueous solution of sodium hydroxide (10 wt%, 2 mL) for 6 h. The reaction mixture was then concentrated and acidified

with 1 N hydrochloric acid. The precipitated solids were isolated by filtration and dried to give the title acid as a white solid (0.9 g).

^{1}H NMR (DMSO-d_6) δ 8.28 (d, 1H), 8.00 (t, 1H), 7.82 (d, 2H), 6.60 (s, 1H), 4.40 (q, 2H), 1.45 (t, 3H), 1.31 (s, 9H).

Step B: Preparation of 6-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino]-2-pyridinecarboxamide

A procedure analogous to that of Example 6 was used to convert 6-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino-2-pyridine-carboxylic acid (520 mg) (i.e. the product of Step A) and dimethylamine (0.5 mL, 2.0 M in THF) to the title compound, a compound of present invention.

^{1}H NMR ($CDCl_3$) δ 8.46 (s, 1H, NH), 8.38 (d, 1H), 7.80 (t, 1H), 7.32 (dd, 1H), 6.55 (s, 1H), 4.60 (q, 2H), 3.14 (s, 3H), 3.02 (s, 3H), 1.43 (t, 3H), 1.30 (s, 9H).

EXAMPLE 10

Preparation of methyl 2-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-4-pyridinecarboxylate (Compound 151)

Step A: Preparation of *N*-(4-methyl-2-pyridinyl)acetamide

A solution of 2-amino-4-picoline (25 g, 231 mmol) in acetic anhydride (150 mL) was heated to reflux for 10 h. The reaction mixture was then cooled to room temperature and concentrated to give a thick oily residue. The residue was dissolved in dichloromethane (400 mL) and washed sequentially with 1 N hydrochloric acid (50 mL) and water (50 mL). The organic phase was dried and concentrated to give the title compound as a white solid (30 g).

Step B: Preparation of 4-(acetylamino)-2-pyridinecarboxylic acid

A procedure analogous to that of Example 8, Step B was used to convert *N*-(4-methyl-2-pyridinyl)acetamide (10 g) (i.e. the product of Step A) to the title acid, which was obtained as a solid (3.4 g).

Step C: Preparation of methyl 4-amino-2-pyridinecarboxylate

A procedure analogous to that of Example 8, Step C was used to convert 4-(acetylamino)-2-pyridinecarboxylic acid (i.e. the product of Step B) (3.4 g) to the title compound (0.92 g).

^{1}H NMR ($CDCl_3$) δ 8.2 (d, 1H), 7.17 (d, 1H), 7.06 (s, 1H), 4.59 (br s, 2H, NH2), 3.92 (s, 3H).

Step D: Preparation of methyl 2-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]-carbonyl]amino]-4-pyridinecarboxylate

A procedure analogous to that of Example 5, Step B was used to convert 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxylic acid (i.e. the product of Example 1, Step D) (1.0 g) and methyl 4-amino-2-pyridinecarboxylate (i.e. the product of Step C) (0.78 g) to the title compound (0.85 g), a compound of present invention.

^{1}H NMR ($CDCl_3$) δ 8.60 (d, 1H), 7.92 (s, 1H, NH), 7.80 (d, 1H), 6.28 (s, 1H), 4.38 (q, 2H), 3.96 (s, 3H), 1.45 (t, 3H), 1.21 (s, 9H).

EXAMPLE 11

Preparation of 2-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-*N*,*N*-dimethyl-4-pyridinecarboxamide (Compound 156)

Step A: Preparation of 2-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino-4-pyridinecarboxylic acid

A procedure analogous to that of Example 9, Step A was used to convert methyl 2-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-4-pyridinecarboxylate (i.e. the compound of Example 10, Step D) (1.02 g, 3.09 mmol) to the title acid as a white solid (0.9 g).

^{1}H NMR (DMSO-d_6) δ 10.84 (s, 1H) 8.64 (s, 1H), 8.52 (d, 1H), 7.60 (d, 1H), 7/18 (s, 1H), 4.40 (q, 2H), 1.32 (t, 3H), 1.23 (s, 9H).

Step B: Preparation of 2-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino]-*N*,*N*-dimethyl-4-pyridinecarboxamide

A procedure analogous to that of Example 5, Step B was used to convert 2-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino-4-pyridinecarboxylic acid (i.e. the compound of Step A) (200 mg) and dimethylamine to the title compound (110 mg), a compound of present invention.

^{1}H NMR ($CDCl_3$) δ 8.68 (s, 1H, NH), 8.40 (d, 2H), 7.04 (d, 1H), 6.61 (s, 1H), 4.58 (q, 2H), 3.18 (s, 3H), 3.00 (s, 3H), 1.42 (t, 3H), 1.31 (s, 9H).

EXAMPLE 12

Preparation of *N*-[3-[(diethylamino)carbonyl]phenyl]-1-(1,1-dimethylethyl)-4-ethyl-1*H*-pyrazole-3-carboxamide (Compound 168)

Step A: Preparation of ethyl 1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxylate and ethyl 1-(1,1-dimethylethyl)-4-ethyl-1*H*-pyrazole-3-carboxylate

Ethyl 2-pentynoate (5.32 g, 42.2 mmol) was added to a solution of 3-(1,1-dimethylethyl)sydnone (6 g, 42.2 mmol) in xylenes (75 mL) under a nitrogen atmosphere. The reaction mixture was heated to reflux for three days and cooled to room temperature.

The resulting white solids were removed by filtration using xylenes for rinsing. The filtrate was concentrated to leave a liquid, which was applied to a silica gel flash column (eluted with hexanes followed by 5:95 ethyl acetate–hexanes) to give the two title isomeric products as oils. Ethyl 1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxylate (3.62 g) was the major isomer. Ethyl 1-(1,1-dimethylethyl)-4-ethyl-1*H*-pyrazole-3-carboxylate (0.78 g) was the minor isomer.

^{1}H NMR ($CDCl_3$) δ major isomer: 7.92 (s, 1H), 4.2 (q, 2H), 2.88 (q, 2H), 1.57 (s, 9H), 1.3 (t, 3H), 1.2 (t, 3H); minor isomer: 7.34 (s, 1H), 4.4 (q, 2H), 2.7 (q, 2H), 1.6 (s, 9H), 1.39 (t, 3H), 1.20 (t, 3H).

Step B: Preparation of 1-(1,1-dimethylethyl)-4-ethyl-1*H*-pyrazole-3-carboxylic acid

A solution of ethyl 1-(1,1-dimethylethyl)-4-ethyl-1*H*-pyrazole-3-carboxylate (i.e. minor isomer product of Step A) (0.75 g, 3.34 mmol) in ethanol (13 mL) was stirred at room temperature with aqueous sodium hydroxide (3 M, 6.7 mL, 20.0 mmol) for 2 days. The reaction mixture was then concentrated, and the pH of the resulting residue was adjusted to 2 with 1 N hydrochloric acid. The aqueous layer was extracted with diethyl ether (3x). The combined organic extracts were washed with brine solution, dried (Na_2SO_4) and concentrated to leave an oil (0.82 g). The oil solidified on standing, and the resulting solids were isolated using filtration and rinsed with hexanes to yield the title acid as a solid (0.53g).

^{1}H NMR ($CDCl_3$) δ 7.38 (s, 1H), 2.77 (q, 2H), 1.6 (s, 9H), 1.21 (t, 3H).

Step C: Preparation of *N*-[3-[(diethylamino)carbonyl]phenyl]-1-(1,1-dimethylethyl)-4-ethyl-1*H*-pyrazole-3-carboxamide

A solution of 1-(1,1-dimethylethyl)-4-ethyl-1*H*-pyrazole-3-carboxylic acid (i.e. product of Step B) (0.1 g, 0.51 mmol) in thionyl chloride (5 mL) was heated at reflux for about four hours. The reaction mixture was concentrated to yield the corresponding acid chloride as a liquid. The acid chloride was added to a solution of 3-amino-*N*,*N*-diethylbenzamide (0.117 g, 0.611 mmol) and triethylamine (107 μL, 0.764 mmol) in dichloromethane (2 mL). After stirring at room temperature overnight, the reaction mixture was concentrated and the resulting residue was partitioned between dichloromethane and 1 N hydrochloric acid. The dichloromethane layer was washed sequentially with 1 N hydrochloric acid and brine, dried and concentrated to give an oil. The oil was purified by column chromatography on silica gel to give the title compound (60 mg), a compound of present invention.

^{1}H NMR ($CDCl_3$) δ 8.86 (br s, 1H), 7.8 (d, 1H), 7.6 (s, 1H), 7.36 (t, 1H), 7.08 (d, 1H), 3.5 (m, 2H), 3.3 (m, 2H), 2.87 (q, 2H), 1.6 (s, 9H), 1.3 (m, 3H), 1.24 (t, 3H), 1.1 (m, 3H).

EXAMPLE 13

Preparation of *N*-[3-[(diethylamino)carbonyl]phenyl]-1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxamide (Compound 182)

Step A: Preparation of 1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxylic acid

A procedure analogous to that of Example 12, Step B was used to convert ethyl 1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxylate (i.e. the major isomer product of Example 12, Step A) (1.76 g, 7.76 mmol) to the title acid (1.08 g).

^{1}H NMR ($CDCl_3$) δ 8.0 (s, 1H), 2.9 (q, 2H), 1.58 (s, 9H), 1.26 (t, 3H).

Step B: Preparation of *N*-[3-[(diethylamino)carbonyl]phenyl]-1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxamide

A procedure analogous to that of Example 12, Step C was used to convert 1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxylic acid (i.e. the product of Step A) (100 mg) and 3-amino-*N*,*N*-diethylbenzamide (0.117g, 0.611 mmol) to the title compound (91 mg), a compound of present invention.

^{1}H NMR ($CDCl_3$) δ 8.0 (s, 1H), 7.7 (br s, 1H), 7.6 (d, 1H), 7.5 (s, 1H), 7.3 (t, 1H), 7.0 (d, 1H), 3.5 (m, 2H), 3.3 (m, 2H), 2.9 (q, 2H), 1.6 (s, 9H), 1.32 (t, 3H), 1.3 (m, 3H), 1.1 (m, 3H).

EXAMPLE 14

Preparation of 4-bromo-1-(1,1-dimethylethyl)-*N*-[3-[(ethylamino)carbonyl]phenyl]-1*H*-pyrazole-3-carboxamide (Compound 221)

Step A: Preparation of ethyl 1-(1,1-dimethylethyl)-1*H*-pyrazole-3-carboxylate

Ethyl propiolate (6.9 g, 70.3 mmol) was added to a solution of 3-(1,1-dimethylethyl)-sydnone (65 g, 35.2 mmol) in toluene (60 mL) under a nitrogen atmosphere. The reaction mixture was heated to reflux for two days and cooled to room temperature. The resulting white solid was removed by filtration using hexanes for rinsing. The filtrate was concentrated to leave a liquid, which was applied to a silica gel flash column (eluted with 100% hexanes followed by 10:90 ethyl acetate–hexanes) to give the title product (2.61 g) as a major isomer.

^{1}H NMR ($CDCl_3$) δ 7.5 (s, 1H), 6.7 (m, 1H), 4.4 (q, 2H), 1.63 (s, 9H), 1.39 (t, 3H).

Step B: Preparation of ethyl 4-bromo-1-(1,1-dimethylethyl)-1*H*-pyrazole-3-carboxylate

To a solution of ethyl 1-(1,1-dimethylethyl)-1*H*-pyrazole-3-carboxylate (i.e. the product of Step A) (0.1 g, 0.509 mmol) in DMF (3.0 mL) at room temperature was added *N*-bromosuccinimide (0.90 mg, 0.509 mmol). After heating to 60 °C for 4 h, the reaction mixture was cooled to room temperature and partitioned between water and diethyl ether

(3x50 mL). The organic extracts were washed with water (4x) and brine, dried (Na_2SO_4) and then concentrated to give the title product as an oil (0.126 mg).

^{1}H NMR ($CDCl_3$) δ 7.6 (s, 1H), 4.4 (q, 2H), 1.6 (s, 9H), 1.4 (t, 3H).

Step C: Preparation of ethyl 4-bromo-1-(1,1-dimethylethyl)-1*H*-pyrazole-3-carboxylic acid

A procedure analogous to that of Example 12, Step B was used to hydrolyze ethyl 4-bromo-1-(1,1-dimethylethyl)-1*H*-pyrazole-3-carboxylate (i.e. the product of Step B) (0.61 g, 2.18 mmol) to give the title acid (0.4 g) as a solid.

^{1}H NMR ($CDCl_3$) δ 7.6 (s, 1H), 1.6 (s, 9H).

Step D: Preparation of 4-bromo-1-(1,1-dimethylethyl)-*N*-[3-[(ethylamino)carbonyl]-phenyl]-1*H*-pyrazole-3-carboxamide

A procedure analogous to that of Example 12, Step C was used to convert ethyl 4-bromo-1-(1,1-dimethylethyl)-1*H*-pyrazole-3-carboxylic acid (i.e. product of Step C) (100 mg, 0.405 mmol) and 3-amino-*N*-ethylbenzamide (70 mg, 0.425 mmol) to the title compound (72 mg), a compound of present invention.

^{1}H NMR ($CDCl_3$) δ 8.82 (br s, 1H), 8.18 (s, 1H), 7.81 (d, 1H), 7.6 (s, 1H), 7.56 (d, 1H), 7.42 (t, 1H), 6.27 (br s, 1H), 3.5 (m, 2H), 1.6 (s, 9H), 1.27 (t, 3H).

EXAMPLE 15

Preparation of *N*-(2,3-dihydro-2-methyl-1-oxo-1*H*-isoindol-4-yl)-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide (Compound 55)

Step A: Preparation of 2,3-dihydro-2-methyl-4-nitro-1*H*-isoindol-1-one

To a solution of methyl 2-(bromomethyl))-3-nitrobenzoate (2.97 g, 10.8 mmol) prepared according to P. Japtap et al. (PCT Application Publication WO 01/77075 A2) in methanol (6 mL) was added a solution of methylamine in methanol (2.0 M, 20 mL). After stirring at room temperature for 3 h, the methanol was evaporated in vacuum and the residue was washed with ether and water to give the title compound as a white solid (0.98 g, 50% yield).

^{1}H NMR ($CDCl_3$): δ 8.39 (d, 1H), 8.18 (d, 1H), 7.70 (t, 1H), 7.27 (s, 1H), 4.87 (s, 2H), 3.27 (t, 3H).

Step B: Preparation of 4-amino-2,3-dihydro-2-methyl-1*H*-isoindol-1-one

A slurry of 2,3-dihydro-2-methyl-4-nitro-1*H*-isoindol-1-one (i.e. product of Step A) (0.97 g, 5.1 mmol) and 10% palladium on carbon (0.24 g) in ethyl acetate (35 mL) was hydrogenated at 45 psi (310 kPa) at room temperature for 5.5 h. The mixture was then filtered through a pad of Celite® diatomaceous filter aid, and the Celite® was extracted with ethyl acetate. The filtrate was concentrated under vacuum to give the title compound (0.81 g, 97% yield).

^{1}H NMR ($CDCl_3$): δ 7.29 (m, 2H), 6.80 (d, 1H), 4.21 (s, 2H), 3.20 (s, 3H).

Step C: Preparation of *N*-(2,3-dihydro-2-methyl-1-oxo-1*H*-isoindol-4-yl)-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide

4-Amino-2,3-dihydro-2-methyl-1*H*-isoindol-1-one (i.e. the product of Step B) (0.15 g, 0.9 mmol) and triethylamine (0.187 g) was dissolved in dichloromethane (4 mL). 3-(1,1-Dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carbonyl chloride (i.e. the product of Example 1, Step E) (0.318 g) was added to the reaction mixture, which was then stirred at room temperature for 2 days. Ethyl acetate (20 mL) and water (2 mL) were added, and the reaction mixture was passed through a Varian Chem Elut filter containing diatomaceous filter aid. The solvent was removed under vacuum, and the residue was triturated with 30% ethyl acetate in hexane to give the title compound, a compound of the invention, as a white solid (0.19 g, 55% yield).

^{1}H NMR ($CDCl_3$): δ 7.74 (d, 1H), 7.72 (s, 1H), 7.58 (d, 1H), 7.55 (t, 1H), 6.52 (s, 1H), 4.57 (q, 2H), 4.43 (s, 2H), 3.20 (s, 3H), 1.45 (t, 3H), 1.34 (s, 9H).

EXAMPLE 16

Preparation of *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxamide (Compound 222)

Step A: Preparation of 4-fluoro-*N*,*N*-dimethyl-3-nitrobenzamide

4-Fluoro-3-nitrobenzoic acid (5 g, 27.0 mmol) was heated at reflux in thionyl chloride (20 mL) for 4 h. The reaction mixture was concentrated, diluted with dichloromethane and then reconcentrated to provide the acid chloride as a liquid. The acid chloride was then diluted with dichloromethane (50 mL). Half of the acid chloride solution was placed in a round-bottom flask and further diluted with dichloromethane to give a total volume of 50 mL. The acid chloride solution was cooled to 0 °C. Triethylamine (3.0 g, 29.7 mmol) was added to the reaction mixture, and then a solution of 40% aqueous solution of dimethylamine (1.52 g, 13.5 mmol) in dichloromethane (20 mL) was added dropwise to the reaction mixture at such a rate that the temperature of the reaction mixture did not exceed 5 °C. The cooled reaction mixture was stirred for 15 minutes more, and then hydrochloric acid (1 N) was added. The layers were separated, and the organic layer was washed with water, saturated aqueous sodium bicarbonate solution and brine, and then dried over sodium sulfate and concentrated to give the title compound (1.87 g).

^{1}H NMR ($CDCl_3$): δ 8.1 (m, 1H), 7.7–7.8 (m, 1H), 7.3–7.4 (m, 1H,), 3.1(s, 3H), 3.0 (s, 3H).
^{19}F NMR ($CDCl_3$): δ –115.5.

Step B: Preparation of 3-amino-4-fluoro-*N*,*N*-dimethylbenzamide

4-Fluoro-*N*,*N*-dimethyl-3-nitrobenzamide (i.e. the product of Step A) (1.76 g, 8.29 mmol) was dissolved in acetic acid (22 mL). The reaction mixture was heated to 85 °C,

and then iron powder (1.39 g) was added in portions. After the addition was complete, the reaction mixture was stirred at 85 °C for an additional 20 minutes. The mixture was then cooled to room temperature and concentrated. Solids were removed by filtration through Celite® diatomaceous filter aid, using ethyl acetate and water for rinsing. The layers in the filtrate were separated. The organic layer was washed sequentially with water, aqueous saturated sodium bicarbonate solution and brine, and then dried over sodium sulfate and concentrated to give the title compound (1.5 g).

^{1}H NMR ($CDCl_3$): δ 6.9–7.0 (m, 1H), 6.8 (m, 1H), 6.69–7.78 (m, 1H), 3.8 (br s, 2H, NH_2), 3.0 (s, 3H), 2.9 (s, 3H).

Step C: Preparation of *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxamide

A procedure analogous to that of Example 12, Step C was used to convert 1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxylic acid (i.e. the product of Example 13, Step A) (100 mg) and 3-amino-4-fluoro-*N*,*N*-dimethylbenzamide (92 mg, 0.509 mmol) (i.e. the product of Step B of Example 16) to the title compound (117 mg), a compound of present invention.

^{1}H NMR ($CDCl_3$): δ 8.5 (m, 1H), 7.9 (s, 1H), 7.7 (br s, 1H, NH), 7.1–7.2 (m, 2H), 3.1(s, 3H), 3.0 (s, 3H), 2.9 (q, 2H), 1.6 (s, 9H), 1.3 (t, 3H).

^{19}F NMR ($CDCl_3$): δ –130.2.

EXAMPLE 17

Preparation of 1-(1,1-dimethylethyl)-3-ethyl-*N*-[3-[(ethylamino)carbonyl]-4-fluorophenyl]-1*H*-pyrazole-4-carboxamide (Compound 241)

Step A: Preparation of *N*-ethyl-2-fluoro-5-nitrobenzamide

A procedure analogous to that of Example 16, Step A was used to convert 2-fluoro-5-nitrobenzoic acid (5 g, 27.0 mmol) and ethylamine (2 M in THF, 10 mL, 19.8 mmol) to give the title compound (1.6 g).

^{1}H NMR ($CDCl_3$): δ 8.9–9.0 (m, 1H), 8.3–8.4 (m, 1H), 7.2–7.3 (m, 1H), 6.6 (t, 1H), 3.5 (q, 2H), 1.2 (t, 3H).

^{19}F NMR ($CDCl_3$): δ –105.2.

Step B: Preparation of 5-amino-*N*-ethyl-2-fluorobenzamide

A procedure analogous to that of Example 16, Step B was used to convert *N*-ethyl-2-fluoro-5-nitrobenzamide (0.78 g, 3.68 mmol) and iron powder (0.62 g, 11.0 mmol) of acetic acid (10 mL) to give the title compound (0.62 g, oil).

^{1}H NMR ($CDCl_3$): δ 7.3 (m, 1H), 6.8–6.9 (m, 1H), 6.6–6.7 (m, 2H), 3.5 (q, 2H), 1.2 (t, 3H).

Step C: Preparation of 1-(1,1-dimethylethyl)-3-ethyl-*N*-[3-[(ethylamino)carbonyl]-4-fluorophenyl]-1*H*-pyrazole-4-carboxamide

To a solution of 1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxylic acid (i.e. the product of Example 13, Step A) (150 mg, 0.76 mmol) in dichloromethane (4 mL) was added sequentially 1-propanephosphonic acid cyclic anhydride (50% in ethyl acetate, 365 mg, 1.14 mmol), 4-(dimethylamino)pyridine (140 mg, 1.14 mmol), 5-amino-*N*-ethyl-2-fluorobenzamide (i.e. the product of Step B) (146 mg, 0.80 mmol) at room temperature. After stirring at room temperature overnight, the reaction mixture was diluted with 1 N hydrochloric acid (3.5 mL) and then filtered thru an Extube™ (tube containing diatomaceous earth marketed by Varian, Inc., 24201 Frampton Avenue, Harbor City, CA 90710 USA), which was rinsed well with dichloromethane. The filtrate was concentrated to leave the crude product as an oil. The crude product was purified by chromatography on silica gel to give an oil. Trituration with diethyl ethyl and hexanes provided the title product, a compound of the present invention, as a white solid, m.p. 168–169 °C.

^{1}H NMR ($CDCl_3$): δ 8.2–8.3 (m, 1H), 7.9 (s, 1H), 7.8 (m, 1H), 7.7 (br s, 1H, NH), 7.1–7.2 (m, 1H), 6.7 (t, 1H), 3.5 (q, 2H), 2.9 (q, 2H), 1.59 (s, 9H), 1.3 (t, 3H), 1.2 (t, 3H).

^{19}F NMR ($CDCl_3$): δ –120.2.

EXAMPLE 18

Preparation of *N*-[3-[(dimethylamino)carbonyl]-4-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide (Compound 236)

A procedure analogous to that of Example 17, Step C was used to convert 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxylic acid (i.e. the product of Example 1, Step D) (200 mg, 1.0 mmol), 1-propanephosphonic acid cyclic anhydride (50% in ethyl acetate, 490 mg 1.5 mmol), 4-(dimethylamino)pyridine (187 mg, 1.5 mmol) and 5-amino-*N*,*N*-dimethyl-2-fluorobenzamide (195 mg, 1.0 mmol) in dichloromethane (4 mL) to the title product, a compound of the present invention, m.p. 93–95 °C.

^{1}H NMR ($CDCl_3$): δ 8.7 (br s, 1H, NH), 7.7–7.8 (m, 1H), 7.4 (m, 1H), 6.9–7.0 (m, 1H), 6.6 (s, 1H), 4.5 (q, 2H), 3.1 (s, 3H), 2.9 (s, 3H), 1.42 (t, 3H), 1.4 (s, 9H).

^{19}F NMR ($CDCl_3$): δ –121.0.

EXAMPLE 19

Preparation of ethyl 5-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino-3-pyridinecarboxylate (Compound 255)

Step A: Preparation of 5-bromo-3-pyridinecarboxylic acid

Thionyl chloride (96.74 g, 58.9 mL, 0.813 mol) was added to 3-pyridinecarboxylic acid (also named nicotinic acid) (20 g, 0.163 mol) and heated at reflux (~80 °C) for 3 h. The thionyl chloride was then distilled off under reduced pressure. The resulting acid chloride

was cooled to 0 to –5 °C, and bromine (13 mL, 0.163 mol) was added. The reaction mixture was heated at 155 °C for 8–10 h, then cooled to room temperature and quenched with ice-cold water (200 mL) added dropwise, causing a white solid to form. The solid was collected using filtration and dried to provide the title compound (31.5 g, 94% yield).

Step B: Preparation of 5-amino-3-pyridinecarboxylic acid

To a mixture of 5-bromo-3-pyridinecarboxylic acid (i.e. the product of Step A) (25 g, 0.124 mol) in aqueous ammonia (67.32 mL) was added copper sulphate pentahydrate (8.41 g), and the reaction mixture heated in an autoclave at 120 °C for 16 h. Progress of the reaction was monitored by thin layer chromatography, using ninhydrin to visualize the product. The reaction mixture was washed with saturated solution of sodium sulfide to remove copper ions and was then acidified to a pH of about 4–5 using concentrated hydrochloric acid, causing a solid to separate as the acidified mixture cooled. The solid was collected using filtration and dried to provide the title compound (12.9 g, 74% yield).

Step C: Preparation of methyl 5-amino-3-pyridinecarboxylate

Over 30 minutes hydrogen chloride gas was bubbled through dry methanol (60 mL) cooled to 0–5 °C. Then 5-amino-3-pyridinecarboxylic acid (i.e. the product of Step B) (6.0 g, 43 mmol) was added, and the reaction mixture was heated at 75 °C for 3 h. The reaction mixture was concentrated, the residue was poured into cold water (30 mL), and the pH of the resulting mixture was increased to 4–5 by adding sodium bicarbonate. The mixture was then extracted with ethyl acetate, and the ethyl acetate extract was washed with water and brine, and then dried (Na_2SO_4) and concentrated. The residue was triturated with ethyl acetate–petroleum ether to yield the title compound (4.2 g, 63% yield).

^{1}H NMR ($CDCl_3$): δ 8.63 (s, 1H, ArH), 8.25 (s, 1H, ArH), 7.57 (s, 1H, ArH), 3.93 (s, 3H, CH_3), 3.87 (br s, 2H, NH_2).

Step D: Preparation of ethyl 5-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino-3-pyridinecarboxylate

To a solution of 3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxylic acid (i.e. the product of Example 1, Step D) (4.00 g, 2.84 mmol) in dry dichloromethane (35 mL) was added oxalyl chloride (3.88 g, 2.47 mL, 30.6 mmol) followed by a few drops of *N*,*N*-dimethylformamide. The resulting solution was stirred and heated to 45 °C for 2.5 h. The dichloromethane solvent and excess oxalyl chloride were removed by distillation under reduced pressure. The resulting residue was diluted with dichloromethane (20 mL) and added to a mixture of methyl 5-amino-3-pyridinecarboxylate (i.e. the product of Step C) (2.98 g, 24.4 mmol) and triethylamine (4.12 g, 5.67 mL, 42.8 mmol) in dichloromethane (20 mL) at 0 °C. The reaction mixture was gradually warmed to room temperature and then heated at 45 °C for 12 h. The dichloromethane solvent was removed by distillation under reduced pressure, and the residue was quenched with ice water and extracted with

dichloromethane (3 x 30 mL). The combined organic extracts were then washed with water and brine. The solution was dried over sodium sulfate and filtered, and the solvent was removed to give the crude product. The crude product was purified by column chromatography (60–120 mesh silica gel, 20% ethyl acetate–petroleum ether) to provide the title product (5.1g, 78% yield), a compound of the present invention.

^{1}H NMR ($CDCl_3$): δ 9.0 (m, 2H, ArH), 8.71 (s, 1H, ArH), 8.01 (s, 1H, ArH), 6.58 (s, 1H, ArH), 4.58 (q, J = 7.2 Hz, 2H, CH_2), 3.98 (s, 3H, CH_3), 1.46 (t, J = 7.2 Hz, 3H, CH_3), 1.34 (s, 9H, 3 CH_3).

EXAMPLE 20

Preparation of 5-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-*N*,*N*-diethyl-3-pyridinecarboxamide (Compound 261)

Step A: Preparation of 5-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-3-pyridinecarboxylic acid

To a solution of ethyl 5-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]-amino-3-pyridinecarboxylate (i.e. the product of Example 19, Step D) (3.11 g, 9.77 mmol) in tetrahydrofuran (20 mL) was added a solution of lithium hydroxide (0.938 g, 39 mmol) in water (10 mL). The reaction mixture was stirred at room temperature for 24 h. The solvent was then evaporated under reduced pressure, and the residue was diluted with water, acidified with hydrochloric acid (1.5 N) to a pH of about 4–5 and extracted with ethyl acetate (2 x 15 mL). The combined organic extracts were washed with cold water and brine, and then dried (Na_2SO_4). The solvent was removed by evaporation to leave the title compound (2.4 g, 92% yield).

^{1}H NMR (DMSO-d_6): δ 13.50 (br s, 1H, OH), 10.49 (s, 1H, NH), 9.10 (s, 1H, ArH), 8.80 (s, 1H, ArH), 8.71 (s, 1H, ArH), 7.00 (s, 1H, ArH), 4.46 (q, J = 6.78 Hz, 2H, CH_2), 1.15–1.35 (m, 12H, 4 CH_3).

Step B: Preparation of 5-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-*N*,*N*-diethyl-3-pyridinecarboxamide

To a solution of 5-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-3-pyridinecarboxylic acid (i.e. the product of Step A) (250 mg, 0.793 mmol) in dichloromethane (5 mL) at room temperature under nitrogen atmosphere was added sequentially 1-propanephosphonic acid cyclic anhydride (50% in ethyl acetate, 2 mL, 3.4 mmol), diethylamine (0.5 mL, 5 mmol) and 4-(dimethylamino)pyridine (0.1 g, 0.8 mmol). The reaction mixture was stirred at room temperature for 6 h and then diluted with additional dichloromethane (10 mL) and washed with hydrochloric acid (1 N, 5 mL). The organic phase was separated, dried and concentrated, and the residue was purified using flash

chromatography to provide the title product, a compound of the present invention, as a solid (256 mg, 84% yield).

^{1}H NMR ($CDCl_3$): δ 8.70 (s, 1H,), 8.42 (s, 1H), 8.18 (m, 1H,), 6.58 (s, 1H), 4.57 (q, 2H), 3.60 (m, 4H), 1.46 (t, 3H), 1.34 (s, 9H), 1.26 (m, 6H).

EXAMPLE 21

Preparation of *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-4-fluoro-1*H*-pyrazole-5-carboxamide (Compound 276)

A solution of *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide (i.e. the product of Example 7, Step D) (0.32 g, 0.88 mmol) and SELECTFLUOR™ fluorinating reagent (1-(chloromethyl-4-fluoro-1,4-diazonia-bicyclo[2.2.2]octane bis(tetrafluoroborate)) (0.72 g, 1.97 mmol) in acetonitrile (10 mL) was heated to reflux for 5 h. The mixture was cooled to room temperature and concentrated, and the residue was diluted with equal volumes of water and dichloromethane. The organic layer was separated and concentrated. The residue was purified by flash column chromatography on silica gel to provide the title product, a compound of the present invention, as a white solid (0.14 g, 42% yield).

^{1}H NMR ($CDCl_3$): δ 8.5 (d, 1H), 8.3 (d, 1H), 7.2 (br s, 1H), 7.17 (m, 1H), 4.55 (q, 2H), 3.1 (d, 6H), 1.43 (t, 3H), 1.37 (s, 9H).

EXAMPLE 22

Preparation of ethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-4,5-dihydro-1*H*-pyrazol-5-yl]carbonyl]amino]-4-fluorobenzoate (Compound 267)

Step A: Preparation of 3,3-dimethyl-1-(triphenylphosphoranylidene)-2-butanone

To a solution of triphenylphosphine (10.74 g, 40.9 mmol) in chloroform (25 mL) was added dropwise 1-bromo-3,3-dimethyl-2-butanone (7.33 g, 40.9 mmol). The cloudy solution was stirred at room temperature overnight. The solvent was removed in vacuo to give a white solid, which was then stirred overnight with saturated aqueous sodium bicarbonate (200 mL) at room temperature. The white solid was then collected by filtration and dried in a vacuum oven to a constant weight of the title compound (13.7 g).

^{1}H NMR ($CDCl_3$): δ 7.8–7.3 (m, 15H), 3.80 (d, 1H), 1.20 (s, 9H).

Step B: Preparation of butyl (2*E*)-5,5-dimethyl-4-oxo-2-hexenoate

A slurry of the 3,3-dimethyl-1-(triphenylphosphoranylidene)-2-butanone (i.e. the product of Step A) (12.5 g, 34.5 mmol) and butyl oxoacetate (4.5 g, 34.5 mmol) in toluene (200 mL) was stirred for 3 days at room temperature. The toluene solvent was removed in vacuo to leave an orange solid as crude product, which was then purified by column chromatography (10% ethyl acetate in hexane) to provide the title compound (5 g) as the trans isomer.

^{1}H NMR ($CDCl_3$): δ 7.51 (d, 1H), 6.77 (d, 1H), 4.21 (t, 2H), 1.68 (m, 2H), 1.41 (m, 2H), 1.20 (s, 9H), 0.95 (t, 3H).

Step C: Preparation of butyl 3-(1,1-dimethylethyl)-1-ethyl-4,5-dihydro-1*H*-pyrazole-5-carboxylate

A slurry of butyl (2*E*)-5,5-dimethyl-4-oxo-2-hexenoate (i.e. the product of Step B) (6.5 g, 30.9 mmol), ethylhydrazine ethanedioate (1:1) (5.6 g, 37.1 mmol), and *N*,*N*-diisopropylethylamine (5.2 g, 40.2 mmol) in methanol (65 mL) was stirred for 5 days at room temperature. The solvent was removed in vacuo, and the residue was purified by column chromatography (3–13% ethyl acetate in hexane) to give the title compound (4.8 g).
^{1}H NMR ($CDCl_3$): δ 4.18 (m, 2H), 3.62 (dd, 1H), 3.06 (m, 2H), 2.95 (m, 2H), 1.62 (m, 2H), 1.39 (m, 2H), 1.18 (t, 3H), 1.15 (s, 9H), 0.94 (t, 3H).

Step D: Preparation of 3-(1,1-dimethylethyl)-1-ethyl-4,5-dihydro-1*H*-pyrazole-5-carboxylic acid

Butyl 3-(1,1-dimethylethyl)-1-ethyl-4,5-dihydro-1*H*-pyrazole-5-carboxylate (i.e. the product of Step C) (1.8 g, 7.1 mmol) was dissolved in ethanol (20 mL), and aqueous sodium hydroxide (10%, 5.7 g) was added. The solution was stirred overnight at room temperature. Most of the ethanol solvent was removed in vacuo, and then the pH of the residual solution was adjusted to 2 using hydrochloric acid (1 N). The cloudy mixture was extracted with ethyl acetate (2x). The combined organic extracts were dried ($MgSO_4$), and the solvent was removed in vacuo to provide the title compound (0.64 g).
^{1}H NMR ($CDCl_3$): δ 3.75 (dd, 1H), 3.24 (m, 1H), 3.05 (m, 1H), 2.92 (dd, 1H), 1.18 (t, 3H), 1.16 (s, 9H).

Step E: Preparation of ethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-4,5-dihydro-1*H*-pyrazol-5-yl]carbonyl]amino]-4-fluorobenzoate

To a stirred solution of 3-(1,1-dimethylethyl)-1-ethyl-4,5-dihydro-1*H*-pyrazole-5-carboxylic acid (i.e. the product of Step D) (0.8 g, 4.1 mmol) in dichloromethane (5 mL) was added 1-propanephosphonic acid cyclic anhydride (50 wt % solution in ethyl acetate, 3.9 g, 6.14 mmol) followed by 4-(dimethylamino)pyridine (0.75 g, 6.14 mmol). After stirring for 1 h, ethyl 3-amino-4-fluorobenzoate (0.68 g, 3.7 mmol) was added, and the resulting solution was stirred at room temperature overnight. The solvent was removed in vacuo and partitioned between water (50 mL) and ethyl acetate (100 mL). The aqueous layer was extracted with ethyl acetate (30 mL). The organic layer was washed with aqueous saturated sodium bicarbonate (50 mL) and water (50 mL), and dried ($MgSO_4$). The solvent was removed in vacuo to provide the title product, a compound of the present invention, as an oil (1.36 g).

^{1}H NMR ($CDCl_3$): δ 9.3 (s, 1H), 8.95 (d, 1H), 7.80 (m, 1H), 7.16 (t, 1H), 3.70 (t, 1H), 3.33 (dd, 1H), 3.18 (dq, 1H), 2.95 (dq, 1H), 2.83 (dd, 1H), 1.39 (t, 3H), 1.21 (t, 3H), 1.17 (s, 9H).

EXAMPLE 23

Preparation of *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-4,5-dihydro-1*H*-pyrazole-5-carboxamide (Compound 268)

To a solution of ethyl 3-[[[3-(1,1-dimethylethyl)-1-ethyl-4,5-dihydro-1*H*-pyrazol-5-yl]carbonyl]amino]-4-fluorobenzoate (i.e. the product of Example 22) (1.0 g, 2.7 mmol) in ethanol (10 mL) was added aqueous sodium hydroxide (10%, 2.2 g). The solution was stirred overnight at room temperature and then concentrated in vacuo. The pH of the solution was adjusted to 2 using hydrochloric acid (1 N). Most of the water was removed in vacuo, and then the cloudy solution was extracted with ethyl acetate. The solvent was removed in vacuo from the organic extract to provide the acid in crude form (0.64 g), which was then dissolved in dichloromethane (20 mL), and oxalyl chloride (0.31 g) and *N*,*N*-dimethylformamide (one drop) were added. The resulting solution was stirred at room temperature overnight. The solvent was removed in vacuo, and more dichloromethane was added, and the solvent was again removed in vacuo. This process was repeated once more to provide the acid chloride in crude form (0.61 g). The acid chloride (0.3 g) was combined with a tetrahydrofuran solution of dimethylamine (2 M, 5 mL), and the reaction mixture was stirred overnight at room temperature. The solvent was removed in vacuo, and the residue was diluted with ethyl acetate and washed with water. The ethyl acetate solution was dried ($MgSO_4$) and evaporated to leave the title product, a compound of the present invention, as an oil (0.20 g).

^{1}H NMR ($CDCl_3$): δ 9.3 (s, 1H), 8.42 (d, 1H), 7.15 (m, 2H), 4.12 (m, 1H), 3.70 (t, 1H), 3.30 (dd, 1H), 3.15 (m, 1H), 3.02 (br d, 6H), 2.95 (m, 1H), 2.80 (dd, 1H), 1.34–1.20 (m, 3H), 1.17 (s, 9H).

EXAMPLE 24

Preparation of 1-(1,1-dimethylethyl)-3-ethyl-*N*-[5-[(ethylamino)carbonyl]-2-fluorophenyl]-4,5-dihydro-1*H*-pyrazole-4-carboxamide (Compound 336)

Step A: Preparation of 3-[(1,3-dioxopentyl)amino]-*N*-ethyl-4-fluorobenzamide

A solution of 3-amino-*N*-ethyl-4-fluorobenzamide (0.50 g, 1.8 mmol) and methyl 3-oxopentanoate (alternatively named methyl propionylacetate; 1.50 g, 11.5 mmol) was heated at 73–80 °C for 60 h. Upon cooling to room temperature, an off-white solid precipitated out; this was collected by filtration and washed successively with hexane and diethyl ether. The solid was dried under vacuum to give the title compound (0.42 g).

^{1}H NMR ($CDCl_3$): δ 9.65 (br s, 1H), 8.64 (dd, 1H), 7.63 (m, 1H), 7.17 (dd, 1H), 6.15 (br s, 1H), 3.61 (s, 2H), 3.48 (q, 2H), 2.62 (q, 2H), 1.24 (t, 3H), 1.14 (t, 3H).

Step B: Preparation of 1-(1,1-dimethylethyl)-3-ethyl-*N*-[5-[(ethylamino)carbonyl]-2-fluorophenyl]-4,5-dihydro-1*H*-pyrazole-4-carboxamide

A solution of 3-[(1,3-dioxopentyl)amino]-*N*-ethyl-4-fluorobenzamide (i.e. the product of Step A) (0.36 g, 1.3 mmol) in methanol (2 mL) was added dropwise to a slurry of sodium acetate (0.165 g) and aqueous formaldehyde (37%, 0.145 g) over 2 minutes. The resulting yellowish solution was stirred at room temperature for 3 h and then partitioned between ethyl acetate (40 mL) and water (10 mL). The organic layer was washed with water (10 mL) and dried ($MgSO_4$), and the solvent was removed in vacuo to leave a gummy solid. This was then stirred with a mixture of *tert*-butylhydrazine hydrochloride (0.177 g) and anhydrous sodium carbonate (0.148 g) in methanol (3 mL) at room temperature for 20 h. Then the solvent was removed using a rotary evaporator, and the residue was purified by column chromatography (ethyl acetate – hexane) to provide 0.17 g of the title compound, a compound of the present invention, as a solid (0.17 g).

^{1}H NMR ($CDCl_3$): δ 9.42 (br s, 1H), 8.63 (dd, 1H), 7.61 (m, 1H), 7.13 (dd, 1H), 6.25 (br s, 1H), 3.64 (dd, 1H), 3.54 (dd, 1H), 3.46 (m, 2H), 3.25 (t, 1H), 2.41 (m, 2H), 1.23 (s, 9H), 1.23 (t, 3H), 1.17 (t, 3H).

EXAMPLE 25

Preparation of *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-2-ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxamide (Compound 352)

Step A: Preparation of ethyl 2-hydroxy-3,3-dimethyl-α-oxo-1-cyclopentene-1-acetate

2,2-Dimethylcyclopentanone (9.6 g) was added to a mixture of diethyl oxalate (11.6 mL), 21% solution of sodium ethoxide in ethanol (11.6 mL) and ethanol (20 mL). The mixture was stirred at room temperature for 18 h. The mixture was then poured onto ice-cold water (200 mL) and acidified to pH 4–5 using acetic acid and extracted with diethyl ether (3 x 50 mL). The organic extracts were washed with water (3 x 50 mL) and dried ($MgSO_4$) and concentrated to provide the title compound as an oil (17.58 g).

^{1}H NMR ($CDCl_3$): δ 12.9 (br s, 1H), 4.36 (q, 2H), 2.9(t, 2H), 1.83 (t, 2H), 1.4 (t, 3H), 1.13 (s, 6H).

Step B: Preparation of tautomeric mixture of ethyl 2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopyrazolecarboxylate and ethyl 1,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate

Hydrazine hydrate (2.5 mL) was added dropwise to ethyl 2-hydroxy-3,3-dimethyl-α-oxo-1-cyclopentene-1-acetate (i.e. the product of Step A) (10 g) dissolved in acetic acid (25 mL) at room temperature, and the mixture was stirred for a further 2 h. The reaction

mixture was poured onto ice water (200 mL) and extracted with ethyl acetate (4 x 50 mL), dried ($MgSO_4$) and concentrated to provide a yellow solid residue. The residue was chromatographed on silica gel using 6:4 hexanes–ethyl acetate as eluant to provide the title tautomeric mixture as an orange solid (7.8 g)

^{1}H NMR ($CDCl_3$): δ 4.36 (q, 2H), 2.8 (t, 2H), 2.29 (t, 2H), 1.4–1.2 (m, 9H).

Step C: Preparation of ethyl 2-ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate and ethyl 1-ethyl-1,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate

To a solution of a tautomeric mixture of ethyl 2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopyrazolecarboxylate and ethyl 1,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate (i.e. the product of Step B) (7.69 g) in *N,N*-dimethylformamide (50 mL), potassium carbonate (7.71 g) and tetrabutylammonium bromide (100 mg) were added. Ethyl iodide (4.44 mL) was added at once, and the mixture was stirred at room temperature for 18 h. The mixture was poured into water (200 mL) and extracted with diethyl ether (3 x 100 mL). The organic phase was washed with water (3 x 50 mL) and dried ($MgSO_4$) and concentrated to provide residue containing mixture of ethyl 2-ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate and ethyl 1-ethyl-1,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate. The residue was chromatographed on silica gel using as eluant hexanes–ethyl acetate (9:1, 8:2, 7:3 and 1:1); the earlier fractions contained ethyl 2-ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate. The fractions were combined and concentrated to provide ethyl 2-ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate (3.7 g). The later fractions contained ethyl 1-ethyl-1,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate. These fractions were combined and concentrated to provide 1-ethyl-1,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate (3.5 g).

Ethyl 2-ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate:

^{1}H NMR ($CDCl_3$): δ 4.53 (q, 2H), 4.31 (q, 2H), 2.75 (t, 2H), 2.21 (t, 2H), 1.42–1.3 (m, 12H).

Ethyl 1-ethyl-1,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate:

^{1}H NMR ($CDCl_3$): δ 4.37 (q, 2H), 4.13 (q, 2H), 2.73 (t, 2H), 2.36 (t, 2H), 1.49 (t, 3H), 1.39(m, 9H).

Step D: Preparation of 2-ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylic acid

To a solution of ethyl 2-ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylate (i.e. first eluted product of Step C) (3.63g) in tetrahydrofuran (25 mL), aqueous sodium hydroxide (1 N, 23.1 mL) was added, and the mixture was stirred at room temperature for 18 h. Then the mixture was acidified with hydrochloric acid (6 N) and

extracted with dichloromethane (3 x 25 mL), dried ($MgSO_4$) and concentrated to provide the title compound as a white solid (3.1 g).

^{1}H NMR ($CDCl_3$): δ 4.56 (q, 2H), 2.84 (m, 2H), 2.24 (m, 2H), 1.42 (t, 3H), 1.32 (s, 6H).

Step E: Preparation of *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-2-ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxamide

2-Ethyl-2,4,5,6-tetrahydro-6,6-dimethyl-3-cyclopentapyrazolecarboxylic acid (i.e. the product of Step D) (0.6 g) was dissolved in dichloromethane (2 mL), and one drop of *N,N*-dimethylformamide was added, followed by oxalyl chloride (0.25 mL), and the mixture was stirred at room temperature for 1 h and concentrated. The residue was dissolved in dichloromethane (2 mL) and then added to solution of 3-amino-4-fluoro-*N,N*-dimethylbenzamide (i.e. the product of Example 7, Step C) (0.6 g) and triethylamine (0.5 mL). The mixture was stirred at room temperature for 2 h and then chromatographed on a column containing silica gel (10 g), using dichloromethane as eluant to provide the title product, a compound of the present invention, as a white solid (0.5 g).

^{1}H NMR ($CDCl_3$): 8.6 (d, 1H), 7.8 (br s, 1H), 7.19 (d, 2H), 4.6 (q, 2H), 3.1 (d, 6H), 2.95 (t, 2H), 2.4 (t, 2H), 1.44 (t, 3H), 1.26 (s, 6H).

EXAMPLE 26

Preparation of ethyl 3-[[[5-ethyl-2-(1-methylethyl)-2*H*-1,2,3-triazol-4-yl]carbonyl]amino]benzoate (Compound 367)

Step A: Preparation of ethyl 5-ethyl-1,2,3-triazole-4-carboxylate

Ethyl 2-pentynoate (16.6 g, 0.132 mol) and trimethylsilylazide (38.0 g, 0.333 mol) were stirred at 100–110 °C under nitrogen for 70 h. After cooling and dilution with methanol (60 mL) a white solid precipitated. After evaporation of the mixture under reduced pressure, the residue was crystallized from ethyl ether to afford the title product as a white solid (15.7 g, 0.093 mol, 70% yield).

^{1}H NMR ($CDCl_3$): 4.42 (q, 2H), 3.07 (q, 2H), 1.37 (t, 3H), 1.32 (t, 3H).

Step B: Preparation of ethyl 5-ethyl-2-(1-methylethyl)-2*H*-1,2,3-triazole-4-carboxylate and ethyl 4-ethyl-1-(1-methylethyl)-1*H*-1,2,3-triazole-5-carboxylate

A mixture of ethyl 5-ethyl-1,2,3-triazole-4-carboxylate (i.e. the product of Step A) (3.84 g, 22.7 mmol), potassium carbonate (5.64 g, 40.9 mmol) and 2-iodopropane (6.95 g, 40.9 mmol) in acetonitrile (68 mL) was stirred at 50–60 °C under nitrogen for 2 h. After cooling to room temperature, the mixture was filtered through a short pad of silica gel and rinsed with ethyl acetate. The solution was concentrated and the residue was purified by column chromatography to provide ethyl 5-ethyl-2-(1-methylethyl)-2*H*-1,2,3-triazole-4-carboxylate (2.87 g, 13.6 mmol, 60% yield), followed by its isomer ethyl 4-ethyl-

1-(1-methylethyl)-1*H*-1,2,3-triazole-5-carboxylate (0.96 g, 4.54 mmol, 20% yield) as white solids.

Ethyl 5-ethyl-2-(1-methylethyl)-2*H*-1,2,3-triazole-4-carboxylate:

^{1}H NMR ($CDCl_3$): 4.82 (m, 1H), 4.42 (q, 2H), 2.95 (q, 2H), 1.58 (d, 6H), 1.41 (t, 3H), 1.28 (t, 3H).

Ethyl 4-ethyl-1-(1-methylethyl)-1*H*-1,2,3-triazole-5-carboxylate:

^{1}H NMR ($CDCl_3$): 5.42 (m, 1H), 4.42 (q, 2H), 2.94 (q, 2H), 1.58 (d, 6H), 1.39 (t, 3H), 1.28 (t, 3H).

Step C: Preparation of ethyl 3-[[[5-ethyl-2-(1-methylethyl)-2*H*-1,2,3-triazol-4-yl]carbonyl]amino]benzoate

To a stirred solution of ethyl 5-ethyl-2-(1-methylethyl)-2*H*-1,2,3-triazole-4-carboxylate (i.e. the first eluted product of Step B) (1.119 g, 5.64 mmol) in tetrahydrofuran (15 mL) was added a solution of lithium hydroxide (0.54 g, 22.56 mmol) in water (15 mL). The mixture was stirred at room temperature overnight, and then partitioned between ether and water. The aqueous layer was acidified with hydrochloric acid (6 N) to pH 1–2 and extracted with ethyl acetate, dried (Na_2SO_4) and concentrated to provide the carboxylic acid intermediate as a white solid (0.94 g, 5.08 mmol, 90% yield). To a stirred solution of the carboxylic acid intermediate (0.78 g, 4.22 mmol) in dichloromethane (25 mL) was added oxalyl chloride (1.61 g, 12.7 mmol) dropwise at room temperature. After stirring the reaction mixture for 10 minutes, *N,N*-dimethylformamide (two drops) was added. The mixture was stirred for an additional 1.5 h and then concentrated to provide the acid chloride intermediate as a pale yellow oil. To a stirred solution of ethyl 3-aminobenzoate (0.70 g, 4.22 mmol), *N,N*-diisopropylethylamine (1.09 g, 8.44 mmol) in dichloromethane (15 mL) was added a solution of the acid chloride intermediate in dichloromethane (5 mL). The reaction mixture was stirred at room temperature for 2 h and then concentrated. The residue was chromatographed to afford the title product, a compound of the present invention, as a white solid (1.36 g, 4.10 mmol, 97% yield).

^{1}H NMR ($CDCl_3$): 8.62 (br s, 1H), 8.14 (d, 1H), 8.10 (s, 1H), 7.81 (d, 1H), 7.43 (t, 1H), 4.80 (m, 1H), 4.40 (q, 2H), 3.04 (q, 2H), 1.61 (d, 6H), 1.41 (t, 3H), 1.32 (t, 3H).

EXAMPLE 27

Preparation of *N*-[3-[(dimethylamino)carbonyl)phenyl]]-5-ethyl-2-(1-methylethyl)-2*H*-1,2,3-triazole-4-carboxamide (Compound 358)

To a stirred solution of ethyl 3-[[[5-ethyl-2-(1-methylethyl)-2*H*-1,2,3-triazol-4-yl]carbonyl]amino]benzoate (i.e. the product of Example 26, Step C) (1.34 g, 4.04 mmol) in tetrahydrofuran (15 mL) was added a solution of lithium hydroxide (0.48 g, 20.2 mmol) in water (15 mL). The mixture was stirred at room temperature overnight, then partitioned between ether and water. The aqueous layer was acidified with hydrochloric acid (6 N) to pH

1–2 and extracted with ethyl acetate, dried (Na_2SO_4) and concentrated to provide the carboxylic acid intermediate as a white solid (1.10 g, 3.62 mmol, 90% yield). A mixture of the carboxylic acid intermediate (130 mg, 0.43 mmol), 4-(dimethylamino)pyridine (78 mg, 0.64 mmol), 1-propanephosphonic acid cyclic anhydride (50 wt % in EtOAc, 423 mg, 0.66 mmol), and dimethylamine (2.0 M in THF, 0.66 mL, 1.32 mmol) in dichloromethane (3 mL) was stirred at room temperature overnight. The mixture was concentrated and the residue was purified by column chromatography to afford the title product, a compound of the present invention, as a white solid (130 mg, 0.40 mmol, 92% yield).

^{1}H NMR ($CDCl_3$): 8.62 (br s, 1H), 7.77 (s, 1H), 7.71 (d, 1H), 7.39 (t, 1H), 7.18 (d, 1H), 4.80 (m, 1H), 2.98–3.10 (m, 8H), 1.60 (d, 6H), 1.32 (t, 3H).

EXAMPLE 28

Preparation of ethyl 3-[[[2-(1,1-dimethylethyl)-5-ethyl-2*H*-1,2,3-triazol-4-yl]carbonyl]amino]benzoate (Compound 360)

Step A: Preparation of ethyl 2-(1,1-dimethylethyl)-5-ethyl-2*H*-1,2,3-triazole-4-carboxylate and ethyl 1-(1,1-dimethylethyl)-4-ethyl-1*H*-1,2,3-triazole-5-carboxylate

To a stirred solution of 5-ethyl-1,2,3-triazole-4-carboxylic acid ethyl ester (i.e. product of Step A of Example 26) (1.05 g, 6.25 mmol) and *tert*-butyl alcohol (0.93 g, 12.5 mmol) in trifluoroacetic acid (6 mL) was added concentrated sulfuric acid (0.61 g, 6.25 mmol). After stirring at room temperature for 14 h, the reaction mixture was partitioned between ethyl acetate and water. The organic layer was washed with water, saturated aqueous sodium carbonate and brine, and then dried (Na_2SO_4). After concentration, the residue was purified by column chromatography to afford ethyl 2-(1,1-dimethylethyl)-5-ethyl-2*H*-1,2,3-triazole-4-carboxylate (0.74 g, 3.76 mmol, 64% yield), followed by its isomer ethyl 1-(1,1-dimethylethyl)-4-ethyl-1*H*-1,2,3-triazole-5-carboxylate (0.24 g, 1.22 mmol, 21% yield) as colorless oils.

Ethyl 2-(1,1-dimethylethyl)-5-ethyl-2*H*-1,2,3-triazole-4-carboxylate:
^{1}H NMR ($CDCl_3$): 4.41 (q, 2H), 2.93 (q, 2H), 1.68 (d, 9H), 1.40 (t, 3H), 1.27 (t, 3H).
Ethyl 1-(1,1-dimethylethyl)-4-ethyl-1*H*-1,2,3-triazole-5-carboxylate:
^{1}H NMR ($CDCl_3$): 4.40 (q, 2H), 2.87 (q, 2H), 1.77 (d, 6H), 1.42 (t, 3H), 1.29 (t, 3H).

Step B: Preparation of ethyl 3-[[[2-(1,1-dimethylethyl)-5-ethyl-2*H*-1,2,3-triazol-4-yl]carbonyl]amino]benzoate

The title product, a compound of the present invention, was prepared from ethyl 2-(1,1-dimethylethyl)-5-ethyl-2*H*-1,2,3-triazole-4-carboxylate (i.e. the first eluted product of Step A) following a procedure analogous to Step C of Example 26.

^{1}H NMR ($CDCl_3$): 8.62 (br s, 1H), 8.14 (d, 1H), 8.09 (s, 1H), 7.81 (d, 1H), 7.44 (t, 1H), 4.80 (m, 1H), 4.40 (q, 2H), 3.04 (q, 2H), 1.70 (s, 9H), 1.41 (t, 3H), 1.31 (t, 3H).

EXAMPLE 29

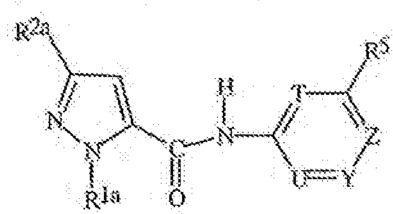
Preparation of 2-(1,1-dimethylethyl)-5-ethyl-*N*-[3-[(ethylamino)carbonyl]phenyl]-2*H*-1,2,3-triazole-4-carboxamide (Compound 365)

The title product, a compound of the present invention, was prepared from ethyl 3-[[[2-(1,1-dimethylethyl)-5-ethyl-2*H*-1,2,3-triazol-4-yl]carbonyl]amino]benzoate (i.e. the product of Step B of Example 28) following a procedure analogous to Example 27.

^{1}H NMR ($CDCl_3$): 8.72 (br s, 1H), 8.06 (s, 1H), 7.88 (d, 1H), 7.53 (d, 1H), 7.36 (t, 1H), 6.71 (br s, 1H), 3.47 (q, 2H), 3.02 (q, 2H), 1.68 (s, 9H), 1.31 (t, 3H), 1.23 (t, 3H).

By the procedures described herein together with methods known in the art, the following compounds of Tables 1 to 15 can be prepared. The following abbreviations are used in the Tables which follow: *t* means tertiary, *s* means secondary, *n* means normal, *i* means iso, *c* means cyclo, Me means methyl, Et means ethyl, Pr means propyl, *i*-Pr means isopropyl, Bu means butyl, Ph means phenyl, OMe means methoxy, OEt means ethoxy, SMe means methylthio, SEt means ethylthio, CN means cyano, NO_2 means nitro, TMS means trimethylsilyl, S(O)Me means methylsulfinyl, and $S(O)_2Me$ means methylsulfonyl. Furthermore, 1-pyrrolyl means $-N(-(CH_2)_5-)$, 3-pyrrolin-1-yl means $-N(-CH_2CH{=}CHCH_2-)$, and 4-morpholinyl means $-N(-(CH_2)_2O(CH_2)_2-)$.

TABLE 1



R^{1a} is Et ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T , U and Y are CH ; Z is CF

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T , U and Y are CH ; Z is CF

R^5	R^5	R^5	R^5
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(O)NHEt$	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C\equiv CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C\equiv CH$
$CO_2(CH_2)_2CH_3$	$C(O)NHMe$	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C\equiv CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	$C(O)NMeEt$
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	$C(O)NMeOMe$	C(O)-(1-pyrrolyl)

R^{1a} is Me ; R^{2a} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C\equiv CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	$C(O)NMeOMe$
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C\equiv CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C\equiv CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	$C(O)NMeEt$
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	$C(O)NHEt$	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	$C(S)NHEt$
$C(O)CF_2H$	$S(O)_2CF_3$	$C(O)NHMe$	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	$OP(O)Me(OMe)$	$OP(O)(OMe)_2$

R^{1a} is Me ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
C(NOH)CH_3	C($NOCH_3$)CH_2CH_3	$S(O)_2NHMe$	$S(O)_2NEt_2$
C(NOH)CH_2CH_3	C(NOH)CH_2CH_2Cl	$S(O)_2NMe_2$	$S(O)_2NH(CH_2)_2CH_3$
C(NOH)CH_2Cl	CN	$S(O)_2NHEt$	$S(O)_2NH(CH_2)_3CH_3$
C(NOH)CH_2Br	C(O)-(3-pyrrolin-1-yl)	C(O)-(1-pyrrolyl)	

R^{1a} is Et ; R^{2a} is isopropyl ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C($NOCH_3$)CH_2CH_3	SCH_2CH_2F	C(O)NEt_2
CO_2CH_3	C(NOH)CH_2CH_2Cl	$S(CH_2)_2CH_3$	C(O)$NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	C(O)$NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	C(O)$NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	S(O)CH_2CH_3	C(O)$NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	C(O)$NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	S(O)$(CH_2)_2CH_3$	C(O)$NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	C(O)$NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	S(O)$(CH_2)_2CH_2Cl$	C(O)$NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	C(O)$NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	S(O)CH_2CH_2F	C(O)$NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	S(O)CH_2CH_2Cl	C(O)$NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	C(O)$NMeCH_2C{\equiv}CH$
C(O)CH_3	O-cyclopropyl	$S(O)_2NHMe$	C(O)$NHCH_2CH{=}CH_2$
C(O)CH_2CH_3	OCH_2OCH_3	$S(O)_2NMe_2$	C(O)$NMeCH_2CH{=}CH_2$
C(NOH)CH_3	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
C(NOH)CH_2CH_3	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
C(O)CH_2Cl	S(O)CH_3	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
C(O)CH_2Br	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	C(O)$NMe(CH_2)_2CH_3$
C(NOH)CH_2Cl	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
C(NOH)CH_2Br	S(O)CF_3	C(O)NH_2	C(S)NHEt
C(O)CF_2H	$S(O)_2CF_3$	C(O)NHMe	C(S)NMe_2
C(O)CH_2CH_2Cl	SCH_2CH_3	C(O)NMe_2	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	OP(O)$(OMe)_2$

R^{1a} is Et ; R^{2a} is isopropyl ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C($NOCH_3$)CH_2CH_3	SCH_2CH_2F	C(O)NEt_2

R^{1a} is Et ; R^{2a} is isopropyl ; U is CF ; T, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is Et ; R^{2a} is cyclopropyl ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$

R^{1a} is Et ; R^{2a} is cyclopropyl ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is CH_2CH_2F ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

R^{1a} is CH_2CH_2F ; R^{2a} is *tert*-Bu ; U is CF ; T, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

R^{1a} is CH_2CF_3 ; R^{2a} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is CH_2CF_3 ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$

R^{1a} is CH_2CF_3 ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is Me ; R^{2a} is *tert*-Bu ; U is N ; T, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$

R^{1a} is Me ; R^{2a} is *tert*-Bu ; U is N ; T, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; U is N ; T, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; U is N ; T, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	$OP(O)Me(OMe)$	$OP(O)(OMe)_2$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T is N ; U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	$C(O)NMeOMe$
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	$C(O)NMeEt$
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholiny()
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	$C(O)NHEt$	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	$C(O)NHMe$	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	$OP(O)Me(OMe)$	$OP(O)(OMe)_2$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T is N ; U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T is N ; U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T , U and Y are CH ; Z is N

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

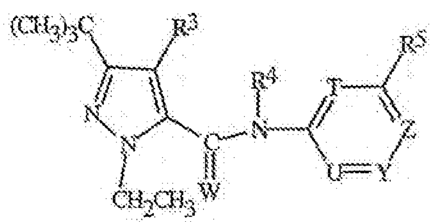
R^{1a} is CH_2CH_3 ; R^{2a} is $Si(CH_3)_3$; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$

R^{1a} is CH_2CH_3 ; R^{2a} is $Si(CH_3)_3$; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

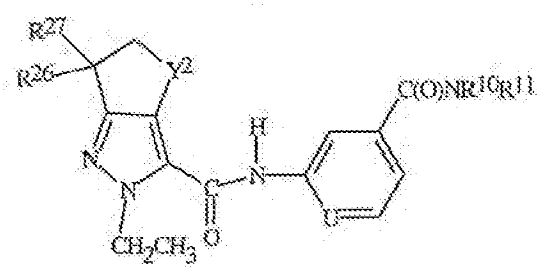
TABLE 2



R^3	R^4	W	R^5	T	U	Y	Z
F	H	O	$C(O)NMe_2$	CH	CH	CH	CH
Me	H	O	C(O)NHEt	CH	CF	CH	CH
Et	H	O	$C(O)NMe_2$	CH	N	CH	CH
H	Me	O	$C(O)NMe_2$	CH	CH	CH	CH
H	Et	O	C(O)NHEt	CH	CF	CH	CH
H	C(O)Et	O	$C(O)NMe_2$	CH	CH	CH	CH
H	C(O)O-*n*-Pr	O	C(O)NHEt	CH	N	CH	CH
H	CH_2OMe	O	$C(O)NMe_2$	CH	CH	CH	CH
H	CH_2S-*n*-Bu	O	C(O)NHEt	CH	CF	CH	CH
H	H	S	$C(O)NMe_2$	CH	CH	CH	CH
H	H	S	C(O)NHEt	CH	CF	CH	CH
H	H	O	$C(O)NMe_2$	N	N	CH	CH
H	H	O	C(O)NHEt	CH	N	CH	N
H	H	O	$C(O)NMe_2$	CH	N	N	CH
H	H	O	C(O)NHEt	N	N	CH	N
H	H	O	$C(O)NMe_2$	CH	CCF_3	CH	CH
H	H	O	C(O)NHEt	CH	COEt	CH	CH
H	H	O	$C(O)NMe_2$	CH	$COCF_2H$	CH	CH
H	H	O	C(O)NHEt	CH	CMe	CH	CH
H	H	O	$C(O)NMe_2$	CH	CEt	CH	CH
H	H	O	C(O)NHEt	CH	CSMe	CH	CH
H	H	O	$C(O)NMe_2$	CH	CSEt	CH	CH

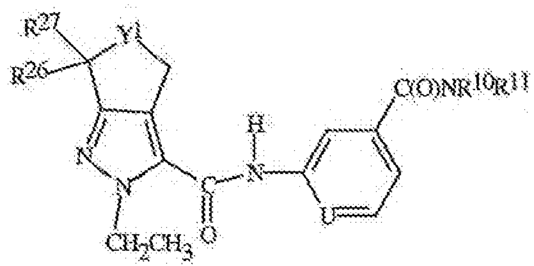
R^3	R^4	W	R^5	T	U	Y	Z
H	H	O	C(O)NHEt	CH	COMe	CH	CH
H	H	O	$C(O)NMe_2$	CH	CH	CF	CH
H	H	O	C(O)NHEt	CH	CH	CCH3	CH
H	H	O	C(O)OEt	CCF_3	CH	CH	CH
H	H	O	C(O)OMe	CSMe	CH	CH	CH
H	H	O	C(O)OEt	$COCF_2H$	CH	CH	CH
H	H	O	C(O)OMe	CMe	CH	CH	CH
H	H	O	C(O)OEt	COMe	CH	CH	CH
H	H	O	C(O)OMe	CH	CH	CH	COMe
H	H	O	C(O)OEt	CH	CH	CH	$COCF_2H$
H	H	O	C(O)OMe	CH	CH	CH	CMe
H	H	O	C(O)OEt	CH	CH	CH	CCF_3
H	H	O	C(O)OMe	CH	CH	CH	CSMe
H	H	O	$-C(O)NHCH_2-$		CH	CH	CH
H	H	O	$-C(O)NMeCH_2-$		CH	CH	CH
H	H	O	$-C(O)NEtCH_2-$		CH	CH	CH
H	H	O	$-C(O)N(cyclo-Pr)CH_2-$		CH	CH	CH
H	H	O	$-C(O)N(i-Pr)CH_2-$		CH	CH	CH
H	H	O	$-C(O)NMeCH_2-$		N	CH	CH
H	H	O	$-C(O)NEtCH_2-$		CF	CH	CH
H	H	O	$-C(O)NMeCH_2CH_2-$		CH	CH	CH

TABLE 3



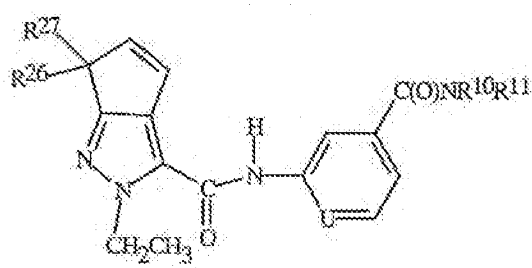
R^{26}	R^{27}	Y^2	U	R^{10}	R^{11}	R^{26}	R^{27}	Y^2	U	R^{10}	R^{11}
Me	Me	CH_2	CH	Me	Me	Me	H	CH_2	CF	H	Et
Me	Me	O	CF	H	Et	Et	H	CH_2	N	Me	Me
Me	Me	S	N	Me	Me	Et	Me	CH_2	CH	H	Et
Me	Me	NH	CH	H	Et	Et	Et	CH_2	CF	Me	Me
Me	Me	NCH_3	CF	Me	Me	Me	Me	CH	CH	H	Et

TABLE 4



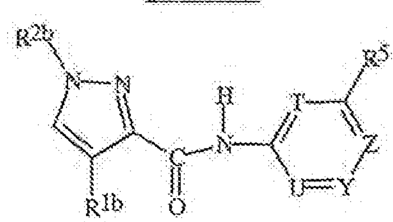
R^{26}	R^{27}	Y^1	U	R^{10}	R^{11}	R^{26}	R^{27}	Y^1	U	R^{10}	R^{11}
Me	Me	CH_2	CH	Me	Me	Me	H	CH_2	CF	H	Et
Me	Me	O	CF	H	Et	Et	H	CH_2	N	Me	Me
Me	Me	S	N	Me	Me	Et	Me	CH_2	CH	H	Et
Me	Me	NH	CH	H	Et	Et	Et	CH_2	CF	Me	Me
Me	Me	NCH_3	CF	Me	Me	Me	Me	CH	CH	H	Et

TABLE 5



R^{26}	R^{27}	U	R^{10}	R^{11}	R^{26}	R^{27}	U	R^{10}	R^{11}
Me	Me	CH	Me	Me	Me	H	CF	H	Et
Me	Me	CF	H	Et	Et	H	N	Me	Me
Me	Me	N	Me	Me	Et	Me	CH	H	Et
Me	Me	CH	H	Et	Et	Et	CF	Me	Me
Me	Me	CF	Me	Me	Me	Me	N	H	Et

TABLE 6



R^{1b} is Et ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Me ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

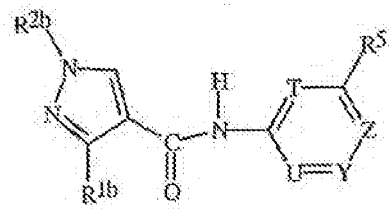
R^{1b} is Et ; R^{2b} is *tert*-Bu ; U is N ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; T is N ; U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	$C(O)NHMe(CH_2)_2CH_3$	C(O)-(1-pyrrolyl)

TABLE 7



R^{1b} is Et ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Me ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

R^{1b} is Me ; R^{2b} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

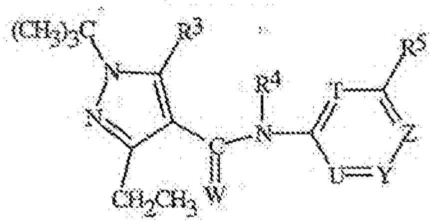
R^{1b} is Et ; R^{2b} is *tert*-Bu ; U is N ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; T is N ; U, Y and Z are CH

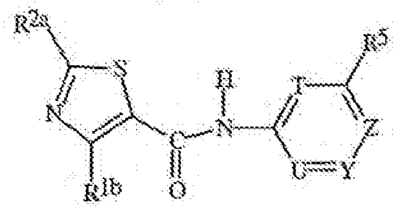
R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

TABLE 8



R^3	R^4	W	R^5	T	U	Y	Z
F	H	O	$C(O)NMe_2$	CH	CH	CH	CH
Me	H	O	C(O)NHEt	CH	CF	CH	CH
Et	H	O	$C(O)NMe_2$	CH	N	CH	CH
H	Me	O	$C(O)NMe_2$	CH	CH	CH	CH
H	C(O)Me	O	$C(O)NMe_2$	CH	CH	CH	CH
H	C(O)OEt	O	C(O)NHEt	CH	N	CH	CH
H	CH_2OMe	O	$C(O)NMe_2$	CH	CH	CH	CH
H	H	S	$C(O)NMe_2$	CH	CH	CH	CH
H	H	S	C(O)NHEt	CH	CF	CH	CH
H	H	O	$C(O)NMe_2$	N	N	CH	CH
H	H	O	$C(O)NMe_2$	CH	CCF_3	CH	CH
H	H	O	C(O)NHEt	CH	CMe	CH	CH
H	H	O	$C(O)NMe_2$	CH	CH	CF	CH
H	H	O	C(O)NHEt	CH	CH	CCH_3	CH
H	H	O	C(O)OMe	CMe	CH	CH	CH
H	H	O	C(O)OEt	COMe	CH	CH	CH
H	H	O	C(O)OMe	CH	CH	CH	COMe
H	H	O	C(O)OMe	CH	CH	CH	CMe

TABLE 9



R^{1b} is Et ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Et ; R^{2a} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$

R^{1b} is Et ; R^{2a} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Me ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

R^{1b} is Me ; R^{2a} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

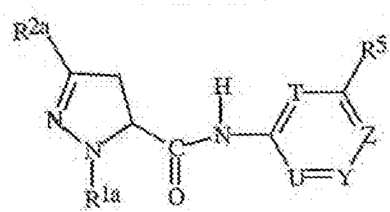
R^{1b} is Et ; R^{2a} is *tert*-Bu ; U is N ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_3)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Et ; R^{2a} is *tert*-Bu ; T is N ; U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

TABLE 10



R^{1a} is Et ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1a} is Et ; R^{2a} is *tert*-Bu ; U is CF ; T, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

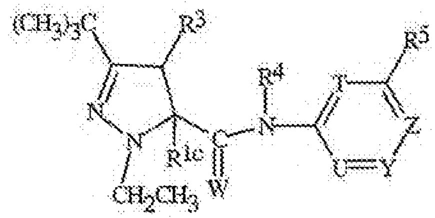
R^{1a} is Et ; R^{2a} is *tert*-Bu ; U is N ; T, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

R^{1a} is Et ; R^{2a} is *tert*-Bu ; T is N ; U, Y and Z are CH

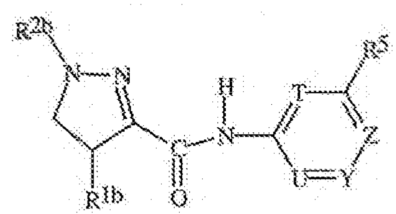
$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

TABLE 11



R^{1c}	R^3	R^4	W	R^5	T	U	Y	Z
H	F	H	O	C(O)NMe_2	CH	CH	CH	CH
H	Me	H	O	C(O)NHEt	CH	CF	CH	CH
H	Et	H	O	C(O)NMe_2	CH	N	CH	CH
H	H	Me	O	C(O)NMe_2	CH	CH	CH	CH
H	H	C(O)Me	O	C(O)NMe_2	CH	CH	CH	CH
H	H	C(O)OEt	O	C(O)NHEt	CH	N	CH	CH
H	H	CH_2OMe	O	C(O)NMe_2	CH	CH	CH	CH
H	H	H	S	C(O)NMe_2	CH	CH	CH	CH
H	H	H	S	C(O)NHEt	CH	CF	CH	CH
H	H	H	O	C(O)NMe_2	N	N	CH	CH
H	H	H	O	C(O)NMe_2	CH	CCF_3	CH	CH
H	H	H	O	C(O)NHEt	CH	CMe	CH	CH
H	H	H	O	C(O)NMe_2	CH	CH	CF	CH
H	H	H	O	C(O)NHEt	CH	CH	CCH_3	CH
H	H	H	O	C(O)OMe	CMe	CH	CH	CH
H	H	H	O	C(O)OEt	COMe	CH	CH	CH
H	H	H	O	C(O)OMe	CH	CH	CH	COMe
H	H	H	O	C(O)OMe	CH	CH	CH	CMe

TABLE 12



R^{1b} is Et ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	C(O)NH$(CH_2)_2CH_2F$	C(O)NH$CH_2C{\equiv}CH$
CO_2CH_3	C(O)NH_2	C(O)NH$(CH_2)_2CH_2Cl$	C(O)NMe$CH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	C(O)NH$(CH_2)_3CH_3$	C(O)NH$CH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	C(O)NMe_2	C(O)NH$(CH_2)_3CH_2F$	C(O)NMe$CH_2CH{=}CH_2$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
$CO_2CH_2C\equiv CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

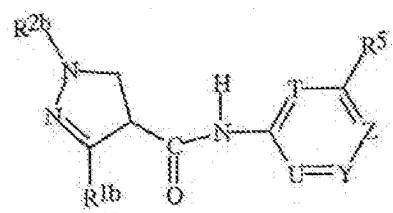
R^{1b} is Et ; R^{2b} is *tert*-Bu ; U is N ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C\equiv CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C\equiv CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C\equiv CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

R^{1b} is Et ; R^{2b} is *tert*-Bu ; T is N ; U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C\equiv CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C\equiv CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C\equiv CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

TABLE 13



R^{1b} is Et ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C\equiv CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C\equiv CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
$CO_2CH_2C{\equiv}CH$	C(O)NEt_2	C(O)NH$(CH_2)_3CH_2Cl$	C(O)NMeEt
C(NOH)CH_3	C(O)$NHCH_2CH_2Cl$	C(O)$NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
C(NOH)CH_2CH_3	C(O)NH$(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

R^{1b} is Et ; R^{2b} is *tert*-Bu ; U is CF ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	C(O)NH$(CH_2)_2CH_2F$	C(O)$NHCH_2C{\equiv}CH$
CO_2CH_3	C(O)NH_2	C(O)NH$(CH_2)_2CH_2Cl$	C(O)$NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	C(O)NH$(CH_2)_3CH_3$	C(O)$NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	C(O)NMe_2	C(O)NH$(CH_2)_3CH_2F$	C(O)$NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	C(O)NEt_2	C(O)NH$(CH_2)_3CH_2Cl$	C(O)NMeEt
C(NOH)CH_3	C(O)$NHCH_2CH_2Cl$	C(O)$NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
C(NOH)CH_2CH_3	C(O)NH$(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

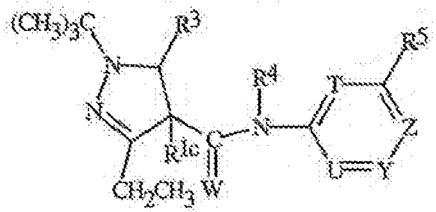
R^{1b} is Et ; R^{2b} is *tert*-Bu ; U is N ; T, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	C(O)NH$(CH_2)_2CH_2F$	C(O)$NHCH_2C{\equiv}CH$
CO_2CH_3	C(O)NH_2	C(O)NH$(CH_2)_2CH_2Cl$	C(O)$NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	C(O)NH$(CH_2)_3CH_3$	C(O)$NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	C(O)NMe_2	C(O)NH$(CH_2)_3CH_2F$	C(O)$NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	C(O)NEt_2	C(O)NH$(CH_2)_3CH_2Cl$	C(O)NMeEt
C(NOH)CH_3	C(O)$NHCH_2CH_2Cl$	C(O)$NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
C(NOH)CH_2CH_3	C(O)NH$(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

R^{1b} is Et ; R^{2b} is *tert*-Bu ; T is N ; U, Y and Z are CH

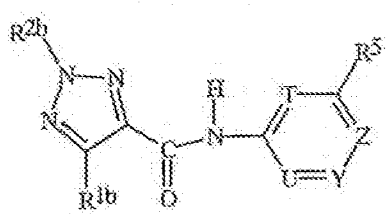
R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	C(O)NH$(CH_2)_2CH_2F$	C(O)$NHCH_2C{\equiv}CH$
CO_2CH_3	C(O)NH_2	C(O)NH$(CH_2)_2CH_2Cl$	C(O)$NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	C(O)NH$(CH_2)_3CH_3$	C(O)$NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	C(O)NMe_2	C(O)NH$(CH_2)_3CH_2F$	C(O)$NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	C(O)NEt_2	C(O)NH$(CH_2)_3CH_2Cl$	C(O)NMeEt
C(NOH)CH_3	C(O)$NHCH_2CH_2Cl$	C(O)$NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
C(NOH)CH_2CH_3	C(O)NH$(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

TABLE 14



R^{1c}	R^3	R^4	W	R^5	T	U	Y	Z
H	F	H	O	$C(O)NMe_2$	CH	CH	CH	CH
H	Me	H	O	C(O)NHEt	CH	CF	CH	CH
H	H	Me	O	$C(O)NMe_2$	CH	CH	CH	CH
H	H	C(O)Me	O	$C(O)NMe_2$	CH	CH	CH	CH
H	H	H	S	$C(O)NMe_2$	CH	CH	CH	CH
H	H	H	O	$C(O)NMe_2$	N	N	CH	CH
H	H	H	O	$C(O)NMe_2$	CH	CCF_3	CH	CH
H	H	H	O	C(O)NHEt	CH	CMe	CH	CH
H	H	H	O	$C(O)NMe_2$	CH	CH	CF	CH
H	H	H	O	C(O)NHEt	CH	CH	CCH_3	CH
H	H	H	O	C(O)OMe	CMe	CH	CH	CH
H	H	H	O	C(O)OMe	CH	CH	CH	CMe
H	Me	H	O	C(O)-(3-pyrrolin-1-yl)	CH	CH	CH	CH
H	H	C(O)OEt	O	C(O)-(1-pyrrolyl)	CH	CF	CH	CH

TABLE 15



R^{1b} is Et ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrrolyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Me ; R^{2b} is *tert*-Bu ; T, U, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	C(O)NMeOMe	C(O)-(1-pyrrolyl)

R^{1b} is Et ; R^{2b} is *tert*-Bu ; U is N ; T, Y and Z are CH

$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$	$\underline{R^5}$
CO_2Et	$C(NOCH_3)CH_2CH_3$	SCH_2CH_2F	$C(O)NEt_2$
CO_2CH_3	$C(NOH)CH_2CH_2Cl$	$S(CH_2)_2CH_3$	$C(O)NHCH_2CH_2F$
$CO_2(CH_2)_2CH_3$	CN	$S(CH_2)_2CH_2F$	$C(O)NHCH_2CH_2Cl$
$CO_2(CH_2)_2CH_2Cl$	OCH_3	$S(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_2CH_3$
$CO_2(CH_2)_2CH_2F$	OCH_2CH_3	$S(O)CH_2CH_3$	$C(O)NH(CH_2)_2CH_2F$
$CO_2CH_2CH_2F$	$O(CH_2)_2CH_3$	$S(O)_2CH_2CH_3$	$C(O)NH(CH_2)_2CH_2Cl$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; U is N ; T, Y and Z are CH

R^5	R^5	R^5	R^5
$CO_2CH_2CH_2Cl$	$O(CH_2)_3CH_3$	$S(O)(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_3$
$CO_2(CH_2)_3CH_3$	OCH_2CH_2F	$S(O)_2(CH_2)_2CH_3$	$C(O)NH(CH_2)_3CH_2F$
$CO_2CH_2CH{=}CH_2$	OCH_2CH_2Cl	$S(O)(CH_2)_2CH_2Cl$	$C(O)NH(CH_2)_3CH_2Cl$
$CO_2CH_2C{\equiv}CH$	$O(CH_2)_2CH_2F$	$S(O)_2(CH_2)_2CH_2Cl$	$C(O)NMeCH_2CH_2F$
CO_2-cyclopropyl	$O(CH_2)_2CH_2Cl$	$S(O)CH_2CH_2F$	$C(O)NMeCH_2CH_2Cl$
CO_2-cyclopentyl	$O(CH_2)_3CH_2Cl$	$S(O)_2CH_2CH_2F$	C(O)NMeOMe
$CO_2CH_2OCH_3$	$O(CH_2)_3CH_2F$	$S(O)CH_2CH_2Cl$	$C(O)NHCH_2C{\equiv}CH$
$CO_2CH_2SCH_3$	O-cyclopentyl	$S(O)_2CH_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$C(O)CH_3$	O-cyclopropyl	$S(O)_2NHMe$	$C(O)NHCH_2CH{=}CH_2$
$C(O)CH_2CH_3$	OCH_2OCH_3	$S(O)_2NMe_2$	$C(O)NMeCH_2CH{=}CH_2$
$C(NOH)CH_3$	OCH_2SCH_3	$S(O)_2NHEt$	C(O)NMeEt
$C(NOH)CH_2CH_3$	SCH_3	$S(O)_2NEt_2$	C(O)-(3-pyrrolin-1-yl)
$C(O)CH_2Cl$	$S(O)CH_3$	$S(O)_2NH(CH_2)_2CH_3$	C(O)-(4-morpholinyl)
$C(O)CH_2Br$	$S(O)_2CH_3$	$S(O)_2NH(CH_2)_3CH_3$	$C(O)NMe(CH_2)_2CH_3$
$C(NOH)CH_2Cl$	SCF_3	C(O)NHEt	C(O)-(1-pyrroiyl)
$C(NOH)CH_2Br$	$S(O)CF_3$	$C(O)NH_2$	C(S)NHEt
$C(O)CF_2H$	$S(O)_2CF_3$	C(O)NHMe	$C(S)NMe_2$
$C(O)CH_2CH_2Cl$	SCH_2CH_3	$C(O)NMe_2$	$OS(O)_2CH_3$
$OS(O)_2CH_2CH_3$	$OS(O)_2CH_2Cl$	OP(O)Me(OMe)	$OP(O)(OMe)_2$

R^{1b} is Et ; R^{2b} is *tert*-Bu ; T is N ; U, Y and Z are CH

R^5	R^5	R^5	R^5
CO_2Et	C(O)NHEt	$C(O)NH(CH_2)_2CH_2F$	$C(O)NHCH_2C{\equiv}CH$
CO_2CH_3	$C(O)NH_2$	$C(O)NH(CH_2)_2CH_2Cl$	$C(O)NMeCH_2C{\equiv}CH$
$CO_2(CH_2)_2CH_3$	C(O)NHMe	$C(O)NH(CH_2)_3CH_3$	$C(O)NHCH_2CH{=}CH_2$
$CO_2CH_2CH{=}CH_2$	$C(O)NMe_2$	$C(O)NH(CH_2)_3CH_2F$	$C(O)NMeCH_2CH{=}CH_2$
$CO_2CH_2C{\equiv}CH$	$C(O)NEt_2$	$C(O)NH(CH_2)_3CH_2Cl$	C(O)NMeEt
$C(NOH)CH_3$	$C(O)NHCH_2CH_2Cl$	$C(O)NMeCH_2CH_2Cl$	C(O)-(3-pyrrolin-1-yl)
$C(NOH)CH_2CH_3$	$C(O)NH(CH_2)_2CH_3$	$C(O)NHMe(CH_2)_2CH_3$	C(O)-(1-pyrrolyl)

Formulation/Utility

Compounds of Formula **I** or **Iz** will generally be used as a formulation or composition with an agriculturally suitable carrier comprising at least one of a liquid diluent, a solid diluent or a surfactant. The formulation or composition ingredients are selected to be consistent with the physical properties of the active ingredient, mode of application and environmental factors such as soil type, moisture and temperature. Useful formulations

include liquids such as solutions (including emulsifiable concentrates), suspensions, emulsions (including microemulsions and/or suspoemulsions) and the like which optionally can be thickened into gels. Useful formulations further include solids such as dusts, powders, granules, pellets, tablets, films, and the like which can be water-dispersible ("wettable") or water-soluble. Active ingredient can be (micro)encapsulated and further formed into a suspension or solid formulation; alternatively the entire formulation of active ingredient can be encapsulated (or "overcoated"). Encapsulation can control or delay release of the active ingredient. Sprayable formulations can be extended in suitable media and used at spray volumes from about one to several hundred liters per hectare. High-strength compositions are primarily used as intermediates for further formulation.

The formulations will typically contain effective amounts of active ingredient, diluent and surfactant within the following approximate ranges which add up to 100 percent by weight.

	Weight Percent		
	Active Ingredient	Diluent	Surfactant
Water-Dispersible and Water-soluble Granules, Tablets and Powders.	5–90	0–94	1–15
Suspensions, Emulsions, Solutions (including Emulsifiable Concentrates)	5–50	40–95	0–15
Dusts	1–25	70–99	0–5
Granules and Pellets	0.01–99	5–99.99	0–15
High Strength Compositions	90–99	0–10	0–2

Typical solid diluents are described in Watkins, et al., *Handbook of Insecticide Dust Diluents and Carriers*, 2nd Ed., Dorland Books, Caldwell, New Jersey. Typical liquid diluents are described in Marsden, *Solvents Guide*, 2nd Ed., Interscience, New York, 1950. *McCutcheon's Detergents and Emulsifiers Annual*, Allured Publ. Corp., Ridgewood, New Jersey, as well as Sisely and Wood, *Encyclopedia of Surface Active Agents*, Chemical Publ. Co., Inc., New York, 1964, list surfactants and recommended uses. All formulations can contain minor amounts of additives to reduce foam, caking, corrosion, microbiological growth and the like, or thickeners to increase viscosity.

Surfactants include, for example, polyethoxylated alcohols, polyethoxylated alkylphenols, polyethoxylated sorbitan fatty acid esters, dialkyl sulfosuccinates, alkyl sulfates, alkylbenzene sulfonates, organosilicones, *N,N*-dialkyltaurates, lignin sulfonates, naphthalene sulfonate formaldehyde condensates, polycarboxylates, and polyoxy-ethylene/polyoxypropylene block copolymers. Solid diluents include, for example, clays

such as bentonite, montmorillonite, attapulgite and kaolin, starch, sugar, silica, talc, diatomaceous earth, urea, calcium carbonate, sodium carbonate and bicarbonate, and sodium sulfate. Liquid diluents include, for example, water, *N,N*-dimethylformamide, dimethyl sulfoxide, *N*-alkylpyrrolidone, ethylene glycol, polypropylene glycol, propylene carbonate, dibasic esters, paraffins, alkylbenzenes, alkylnaphthalenes, oils of olive, castor, linseed, tung, sesame, corn, peanut, cotton-seed, soybean, rape-seed and coconut, fatty acid esters, ketones such as cyclohexanone, 2-heptanone, isophorone and 4-hydroxy-4-methyl-2-pentanone, and alcohols such as methanol, cyclohexanol, decanol, benzyl and tetrahydrofurfuryl alcohol.

Solutions, including emulsifiable concentrates, can be prepared by simply mixing the ingredients. Dusts and powders can be prepared by blending and, usually, grinding as in a hammer mill or fluid-energy mill. Suspensions are usually prepared by wet-milling; see, for example, U.S. 3,060,084. Granules and pellets can be prepared by spraying the active material upon preformed granular carriers or by agglomeration techniques. See Browning, "Agglomeration", *Chemical Engineering*, December 4, 1967, pp 147–48, *Perry's Chemical Engineer's Handbook*, 4th Ed., McGraw-Hill, New York, 1963, pages 8–57 and following, and WO 91/13546. Pellets can be prepared as described in U.S. 4,172,714. Water-dispersible and water-soluble granules can be prepared as taught in U.S. 4,144,050, U.S. 3,920,442 and DE 3,246,493. Tablets can be prepared as taught in U.S. 5,180,587, U.S. 5,232,701 and U.S. 5,208,030. Films can be prepared as taught in GB 2,095,558 and U.S. 3,299,566.

For further information regarding the art of formulation, see T. S. Woods, "The Formulator's Toolbox – Product Forms for Modern Agriculture" in *Pesticide Chemistry and Bioscience, The Food–Environment Challenge*, T. Brooks and T. R. Roberts, Eds., Proceedings of the 9th International Congress on Pesticide Chemistry, The Royal Society of Chemistry, Cambridge, 1999, pp. 120–133. See also U.S. 3,235,361, Col. 6, line 16 through Col. 7, line 19 and Examples 10–41; U.S. 3,309,192, Col. 5, line 43 through Col. 7, line 62 and Examples 8, 12, 15, 39, 41, 52, 53, 58, 132, 138–140, 162–164, 166, 167 and 169–182; U.S. 2,891,855, Col. 3, line 66 through Col. 5, line 17 and Examples 1–4; Klingman, *Weed Control as a Science*, John Wiley and Sons, Inc., New York, 1961, pp 81–96; and Hance et al., *Weed Control Handbook*, 8th Ed., Blackwell Scientific Publications, Oxford, 1989.

In the following Examples, all percentages are by weight and all formulations are prepared in conventional ways. Compound numbers refer to compounds in Index Tables A–K.

Example A

High Strength Concentrate

Compound 2	98.5%
silica aerogel	0.5%
synthetic amorphous fine silica	1.0%.

Example B

Wettable Powder

Compound 6	65.0%
dodecylphenol polyethylene glycol ether	2.0%
sodium ligninsulfonate	4.0%
sodium silicoaluminate	6.0%
montmorillonite (calcined)	23.0%.

Example C

Granule

Compound 156	10.0%
attapulgite granules (low volatile matter, 0.71/0.30 mm; U.S.S. No. 25–50 sieves)	90.0%.

Example D

Aqueous Suspension

Compound 2	25.0%
hydrated attapulgite	3.0%
crude calcium ligninsulfonate	10.0%
sodium dihydrogen phosphate	0.5%
water	61.5%.

Example E

Extruded Pellet

Compound 6	25.0%
anhydrous sodium sulfate	10.0%
crude calcium ligninsulfonate	5.0%
sodium alkylnaphthalenesulfonate	1.0%
calcium/magnesium bentonite	59.0%.

Test results indicate that the compounds of the present invention are highly active preemergent and postemergent herbicides or plant growth regulants. Many of the compounds of this invention, by virtue of selective metabolism in crops versus weeds, or by selective activity at the locus of physiological inhibition in crops and weeds, or by selective placement on or within the environment of a mixture of crops and weeds, are useful for the

selective control of grass and/or broadleaf weeds within a crop/weed mixture. Compounds of this invention may show tolerance to important agronomic crops including, but not limited to, alfalfa, barley, cotton, wheat, rape, sugar beets, corn (maize), sorghum, soybeans, sunflower, rice, oats, peanuts, vegetables, tomato, potato and perennial plantation crops. Those skilled in the art will appreciate that not all compounds are equally effective against all weeds. Compounds of the invention are particularly useful for selective control of weeds in perennial plantation crops, transplanted rice, maize and cool-season cereal crops. Of particular note is the use of compounds of the invention for selective weed control in perennial plantation crops (also known as permanent crops) including: fruit trees such as citrus (e.g., orange, lemon, lime, grapefruit, tangerine), pome fruits (e.g., apple, pear, quince) and stone fruits (e.g., peach, nectarine, apricot, plum, cherry), nut trees (e.g., almond, hickory, pecan, walnut, cashew, chestnut, filbert, macademia, pistachio), forest trees such as hardwoods (e.g., eucalyptus, oak, maple, birch, ash) and softwoods (i.e. conifers such as fir, redwood, spruce, cedar, cypress, larch, hemlock, loblolly and other pines), banana, plantain, pineapple, hops, coffee, tea, cocoa, oilseed palm, rubber, sugarcane, grapes (e.g., *Vitus vinifera*, *V. labrusca*, *V. rotundifolia*), and perennial turf grasses (e.g., Kentucky bluegrass, St. Augustine grass, Kentucky fescue, Bermuda grass). Alternatively, the subject compounds are useful to modify plant growth. The formulated compounds can be applied to the soil, for example, as a treatment spray mixture, mixed with solid fertilizer or included in irrigation water.

Many of the compounds have utility for broad-spectrum pre- and/or postemergence weed control in areas where complete control of all vegetation is desired such as around fuel storage tanks, industrial storage areas, parking lots, drive-in theaters, air fields, river banks, irrigation and other waterways, around billboards and highway and railroad structures. One skilled in the art will recognize that the preferred combination of these selectivity factors within a compound or group of compounds can readily be determined by performing routine biological and/or biochemical assays.

As the compounds of the invention have both preemergent and postemergent herbicidal activity, to control undesired vegetation by killing or injuring the vegetation or reducing its growth, the compounds can be usefully applied by a variety of methods which can include banding, directed sprays, or broadcast applications that involve contacting a herbicidally effective amount of a compound of the invention, or a composition comprising said compound and at least one of a surfactant, a solid diluent or a liquid diluent, to the foliage or other part of the undesired vegetation or to the environment of the undesired vegetation such as the soil or water in which the undesired vegetation is growing or which surrounds the seed or other propagule of the undesired vegetation.

A herbicidally effective amount of the compounds of Formula **I** or **Iz** is determined by a number of factors. These factors include: formulation selected, method of application,

amount and type of vegetation present, growing conditions, etc. In general, a herbicidally effective amount of compounds of this invention is about 0.1 g/ha to 20 kg/ha, with a preferred range of about 1 g/ha to about 5000 g/ha and a more preferred range of about 4 to about 3000 g/ha. One skilled in the art can easily determine the herbicidally effective amount necessary for the desired level of weed control.

The compounds of Formula **Iz** (including Formula **I**) may be used in combination with other herbicides, insecticides, or fungicides, and other agricultural chemicals such as fertilizers. Other herbicides, insecticides and fungicides can include biological agents such as the herbicidal microbes *Alternaria destruens*, *Colletotrichum gloesporiodes*, *Drechsiera monoceras* (MTB-951) and *Puccinia thlaspeos*. Mixtures of compounds of Formula **Iz** (or **I**) with other herbicides can broaden the spectrum of activity against additional weed species, and suppress the proliferation of any resistant biotypes. Mixtures of compounds of Formula **Iz** (or **I**) with other herbicides can also provide greater than expected (i.e. synergistic) control of weeds and/or less than expected (i.e. safening) effect on crops. Therefore an aspect of the present invention relates to a herbicidal mixture comprising a herbicidally effective amount of a compound of Formula **Iz** and an effective amount of another herbicide. Of note is said herbicidal mixture wherein the compound of Formula **Iz** is a compound of Formula **I**. A mixture of one or more of the following other herbicides with a compound of Formula **Iz** may be particularly useful for weed control: acetochlor, acifluorfen and its sodium salt, aclonifen, acrolein (2-propenal), alachlor, alloxydim, *Alternaria destruens*, ametryn, amicarbazone, amidosulfuron, amitrole, ammonium sulfamate, anilofos, asulam, atrazine, azafenidin, azimsulfuron, beflubutamid, benazolin, benazolin-ethyl, benfluralin, benfuresate, bensulfuron-methyl, bensulide, bentazone, benzfendizone, benzobicyclon, benzofenap, bifenox, bilanafos, bispyribac and its sodium salt, bromacil, bromobutide, bromoxynil, bromoxynil octanoate, butachlor, butafenacil, butamifos, butralin, butroxydim butylate, cafenstrole, caloxydim (BAS 620H), carbetamide, carfentrazone-ethyl, catechin, chlomethoxyfen, chloramben, chlorbromuron, chlorflurenol-methyl, chloridazon, chlorimuron-ethyl, chlornitrofen, chlorotoluron, chlorpropham, chlorsulfuron, chlorthal-dimethyl, chlorthiamid, cinidon-ethyl, cinmethylin, cinosulfuron, clethodim, clodinafop-propargyl, clomazone, clomeprop, clopyralid, clopyralid-olamine, cloransulam-methyl, *Colletotrichum gloesporiodes*, cumyluron, cyanazine, cycloate, cyclosulfamuron, cycloxydim, cyhalofop-butyl, 2,4-D and its butotyl, butyl, isoctyl and isopropyl esters and its dimethylammonium, diolamine and trolamine salts, daimuron, dalapon, dalapon-sodium, dazomet, 2,4-DB and its dimethylammonium, potassium and sodium salts, desmedipham, desmetryn, dicamba and its diglycolammonium, dimethylammonium, potassium and sodium salts, dichlobenil, dichlorprop, diclofop-methyl, diclosulam, difenzoquat metilsulfate, diflufenican, diflufenzopyr, dimefuron, dimepiperate, dimethachlor, dimethametryn, dimethenamid, dimethipin, dimethylarsinic acid and its sodium salt, dinitramine, dinoterb,

diphenamid, diquat dibromide, dithiopyr, diuron, DNOC, *Drechsiera monoceras*, endothal, EPTC, esprocarb, ethalfluralin, ethametsulfuron-methyl, ethofumesate, ethoxysulfuron, etobenzanid, fenoxaprop-ethyl, fenoxaprop-P-ethyl, fentrazamide, fenuron, fenuron-TCA, flamprop-methyl, flamprop-M-isopropyl, flamprop-M-methyl, flazasulfuron, florasulam, fluazifop-butyl, fluazifop-P-butyl, fluazolate, flucarbazone, fluchloralin, flufenacet, flufenpyr-ethyl, flumetsulam, flumiclorac-pentyl, flumioxazin, fluometuron, fluoroglycofen-ethyl, flupoxam, flupyrsulfuron-methyl and its sodium salt, fluridone, flurochloridone, fluroxypyr, flurtamone, fluthiacet-methyl, fomesafen, foramsulfuron, fosamine-ammonium, furilazole, glufosinate and its salts such as particularly glufosinate-ammonium, glyphosate and its salts such as particularly glyphosate-ammonium, glyphosate-isopropylammonium, glyphosate-sodium, glyphosate-potassium and glyphosate-trimesium, halosulfuron-methyl, haloxyfop-etotyl, haloxyfop-methyl, hexazinone, imazamethabenz-methyl, imazamox, imazapic, imazapyr, imazaquin, imazaquin-ammonium, imazethapyr, imazethapyr-ammonium, imazosulfuron, indanofan, iodosulfuron-methyl, ioxynil, ioxynil octanoate, ioxynil-sodium, isoproturon, isouron, isoxaben, isoxaflutole, lactofen, lenacil, linuron, maleic hydrazide, MCPA and its dimethylammonium, potassium and sodium salts, MCPA-isoctyl, MCPB and its sodium salt, MCPB-ethyl, mecoprop, mecoprop-P, mefenacet, mefluidide, mesosulfuron-methyl, mesotrione, metam-sodium, metamifop, metamitron, metazachlor, methabenzthiazuron, methylarsonic acid and its calcium, monoammonium, monosodium and disodium salts, methyldymron, methyl [[[1-[5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrophenyl]-2-methoxyethylidene]amino]oxy]-acetate (AKH-7088), methyl 5-[[[[(4,6-dimethyl-2-pyrimidinyl)amino]carbonyl]amino]-sulfonyl]-1-(2-pyridinyl)-1*H*-pyrazole-4-carboxylate (NC-330), metobenzuron, metobromuron, metolachlor, S-metholachlor, metosulam, metoxuron, metribuzin, metsulfuron-methyl, molinate, monolinuron, naproanilide, napropamide, naptalam, neburon, nicosulfuron, norflurazon, orbencarb, oryzalin, oxadiargyl, oxadiazon, oxasulfuron, oxaziclomefone, oxyfluorfen, paraquat dichloride, pebulate, pendimethalin, penoxsulam, pentanochlor, pentoxazone, perfluidone, pethoxamid, phenmedipham, picloram, picloram-potassium, picolinafen, piperofos, pretilachlor, primisulfuron-methyl, prodiamine, profoxydim (BAS625H, 2-[1-[[2-(4-chlorophenoxy)propoxy]imino]butyl]-3-hydroxy-5-(tetrahydro-2*H*-thiopyran-3-yl)-2-cyclohexen-1-one), prometon, prometryn, propachlor, propanil, propaquizafop, propazine, propham, propisochlor, propoxycarbazone, propyzamide, prosulfocarb, prosulfuron, *Puccinia thlaspeos*, pyraflufen-ethyl, pyrazolynate, pyrazoxyfen, pyrazosulfuron-ethyl, pyribenzoxim, pyributicarb, pyridate, pyriftalid, pyriminobac-methyl, pyrithiobac, pyrithiobac-sodium, quinclorac, quinmerac, quinoclamine, quizalofop-ethyl, quizalofop-P-ethyl, quizalofop-P-tefuryl, rimsulfuron, sethoxydim, siduron, simazine, simetryn, sulcotrione, sulfentrazone, sulfometuron-methyl, sulfosulfuron, 2,3,6-TBA, TCA, TCA-sodium, tebutam, tebuthiuron, tepraloxydim, terbacil, terbumeton,

terbuthylazine, terbutryn, thenylchlor, thiafluamide (BAY 11390), thiazopyr, thifensulfuron-methyl, thiobencarb, tiocarbazil, tralkoxydim, tri-allate, triasulfuron, triaziflam, tribenuron-methyl, triclopyr, triclopyr-butotyl, triclopyr-triethylammonium, tridiphane, trietazine, trifloxysulfuron, trifluralin, triflusulfuron-methyl, tritosulfuron and vernolate. Combinations of compounds of the invention with other herbicides can result in a greater-than-additive (i.e. synergistic) effect on weeds and/or a less-than-additive effect (i.e. safening) on crops or other desirable plants. For example, combination of a sulfonylurea herbicide such as thifensulfuron-methyl and tribenuron-methyl with a compound of the invention can reduce phytotoxicity to certain crops.

In certain instances, combinations with other herbicides having a similar spectrum of control but a different mode of action will be particularly advantageous for preventing the development of resistant weeds.

Preferred for better control of undesired vegetation (e.g., lower use rate such as from synergism, broader spectrum of weeds controlled, or enhanced crop safety) or for preventing the development of resistant weeds is a herbicidal mixture of a compound of Formula **Iz** (including Formula **I**) with an other herbicide selected from the group consisting of atrazine, bromacil, diuron, hexazinone, terbacil, glyphosate (particularly glyphosate-ammonium, glyphosate-isopropylammonium, glyphosate-sodium, glyphosate-potassium, glyphosate-trimesium), glufosinate (particularly glufosinate-ammonium), rimsulfuron, metsulfuron-methyl, sulfometuron-methyl, ametryn and paraquat. Specifically preferred mixtures (wherein compound A is *N*-[3-[(dimethylamino)carbonyl]phenyl]-3-(1,1-dimethylethyl)-1-methyl-1*H*-pyrazole-5-carboxamide (Formula **Iz** wherein J is J-1, R^{1a} is Me, R^{2a} is *t*-Bu, R^3 is H, W is O, R^4 is H, T, U, Y and Z are CH, and R^5 is $C(O)NMe_2$); other compound numbers refer to compounds in Index Tables A–K) are selected from the group: compound 2 and atrazine; compound 6 and atrazine; compound 14 and atrazine; compound 115 and atrazine; compound 152 and atrazine; compound 156 and atrazine; compound 162 and atrazine; compound 193 and atrazine; compound 222 and atrazine; compound A and atrazine, compound 2 and bromacil; compound 6 and bromacil; compound 14 and bromacil; compound 115 and bromacil; compound 152 and bromacil; compound 156 and bromacil; compound 162 and bromacil; compound 193 and bromacil; compound 222 and bromacil; compound A and bromacil; compound 2 and diuron; compound 6 and diuron; compound 14 and diuron; compound 115 and diuron; compound 152 and diuron; compound 156 and diuron; compound 162 and diuron; compound 193 and diuron; compound 222 and diuron; compound A and diuron; compound 2 and hexazinone; compound 6 and hexazinone; compound 14 and hexazinone; compound 115 and hexazinone; compound 152 and hexazinone; compound 156 and hexazinone; compound 162 and hexazinone; compound 193 and hexazinone; compound 222 and hexazinone; compound A and hexazinone; compound 2 and terbacil; compound 6 and

terbacil; compound 14 and terbacil; compound 115 and terbacil; compound 152 and terbacil; compound 156 and terbacil; compound 162 and terbacil; compound 193 and terbacil; compound 222 and terbacil; compound A and terbacil; compound 2 and glyphosate; compound 6 and glyphosate; compound 14 and glyphosate; compound 115 and glyphosate; compound 152 and glyphosate; compound 156 and glyphosate; compound 162 and glyphosate; compound 193 and glyphosate; compound 222 and glyphosate; compound A and glyphosate; compound 2 and glufosinate; compound 6 and glufosinate; compound 14 and glufosinate; compound 115 and glufosinate; compound 152 and glufosinate; compound 156 and glufosinate; compound 162 and glufosinate; compound 193 and glufosinate; compound 222 and glufosinate; compound A and glufosinate; compound 2 and rimsulfuron; compound 6 and rimsulfuron; compound 14 and rimsulfuron; compound 115 and rimsulfuron; compound 152 and rimsulfuron; compound 156 and rimsulfuron; compound 162 and rimsulfuron; compound 193 and rimsulfuron; compound 222 and rimsulfuron; compound A and rimsulfuron; compound 2 and metsulfuron-methyl; compound 6 and metsulfuron-methyl; compound 14 and metsulfuron-methyl; compound 115 and metsulfuron-methyl; compound 152 and metsulfuron-methyl; compound 156 and metsulfuron-methyl; compound 162 and metsulfuron-methyl; compound 193 and metsulfuron-methyl; compound 222 and metsulfuron-methyl; compound A and metsulfuron-methyl; compound 2 and sulfometuron-methyl; compound 6 and sulfometuron-methyl; compound 14 and sulfometuron-methyl; compound 115 and sulfometuron-methyl; compound 152 and sulfometuron-methyl; compound 156 and sulfometuron-methyl; compound 162 and sulfometuron-methyl; compound 193 and sulfometuron-methyl; compound 222 and sulfometuron-methyl; compound A and sulfometuron-methyl; compound 2 and ametryn; compound 6 and ametryn; compound 14 and ametryn; compound 115 and ametryn; compound 152 and ametryn; compound 156 and ametryn; compound 162 and ametryn; compound 193 and ametryn; compound 222 and ametryn; compound A and ametryn; compound 2 and paraquat; compound 6 and paraquat; compound 14 and paraquat; compound 115 and paraquat; compound 152 and paraquat; compound 156 and paraquat; compound 162 and paraquat; compound 193 and paraquat; compound 222 and paraquat; compound A and paraquat. Particularly preferred because of greater than additive (i.e. synergistic) efficacy on certain weeds are mixtures of compound 2 and diuron; compound 2 and terbacil; compound 6 and atrazine; compound 6 and diuron; compound 6 and hexazinone; and compound 6 and terbacil. Herbicidally effective amounts of compounds of Formula **Iz** (including Formula **I**) as well as herbicidally effective amounts of other herbicides can be easily determined by one skilled in the art through simple experimentation. Synergistically effective amounts of these herbicidal compounds can likewise be easily determined.

Mixtures of compound 6 with diuron and hexazinone are especially notable for their synergistic activity in controlling *Urochloa* species (previously classified in genus

Brachiaria) such as *Urochloa decumbens* (Staph) R. D. Webster, which is commonly known as Surinam grass or signal grass. *U. decumbens* is native to central Africa, but because it grows satisfactorily on poor soils, it has been planted in other tropical and subtropical regions for use as cattle forage. Unfortunately this species has subsequently become widespread and troublesome in many crops. As reported by R. A. Pitelli et al., "*Brachiaria decumbens*, a major exotic invasive plant in Brazil", *Weed Science Society of America Abstracts* **2003**, *43*, 23, this species has become a major weed in forestry, citrus, sugarcane, horse pastures and roadsides as well as soybean, maize and cotton crops. Therefore a preferred embodiment of the present invention is a method for controlling the growth of undesired vegetation comprising *Urochloa decumbens* (Staph) R. D. Webster comprising contacting the vegetation or its environment with herbicidally effective amounts of the compound of Formula **I** (or **Iz**) which is *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide (compound 6) and at least one other herbicide selected from the group consisting of diuron and hexazinone. In said method compound 6 is typically applied at an application rate between about 60 and 600 g/ha, preferably between about 120 and 450 g/ha, and more preferably between about 240 and 360 g/ha; diuron is typically applied between about 250 and 2500 g/ha, preferably between about 500 and 2000 g/ha, and more preferably between about 960 and 1440 g/ha; and hexazinone is typically applied between about 100 and 600 g/ha, preferably between about 200 and 450 g/ha, more preferably between about 240 and 360 g/ha. Typical use rate ratios by weight for compound 6 to diuron (compound 6 : diuron) are in the range of about 1:40 to 2:1, preferably about 1:17 to 1:1, and more preferably about 1:6 to about 1:3. Typical use rate ratios by weight for compound 6 to hexazinone are in the range of about 1:10 to 6:1, preferably about 1:4 to 2:1, and more preferably about 2:3 to 3:2.

Compounds of Formula **Iz** (including Formula **I**) can also be used in combination with herbicide safeners such as benoxacor, BCS (1-bromo-4-[(chloromethyl)sulfonyl]benzene), cloquintocet-mexyl, cyometrinil, dichlormid, 2-(dichloromethyl)-2-methyl-1,3-dioxolane (MG 191), fenchlorazole-ethyl, fenclorim, flurazole, fluxofenim, furilazole, isoxadifen-ethyl, mefenpyr-ethyl, methoxyphenone ((4-methoxy-3-methylphenyl)(3-methylphenyl)-methanone), naphthalic anhydride (1,8-naphthalic anhydride) and oxabetrinil to increase safety to certain crops. Antidotally effective amounts of the herbicide safeners can be applied at the same time as the compounds of this invention, or applied as seed treatments. Therefore an aspect of the present invention relates to a herbicidal mixture comprising a compound of Formula **Iz** and an antidotally effective amount of a herbicide safener. Seed treatment is particularly useful for selective weed control, because it physically restricts antidoting to the crop plants. Therefore a particularly useful embodiment of the present invention is a method for selectively controlling the growth of undesired vegetation in a crop comprising contacting the locus of the crop with a herbicidally effective amount of a

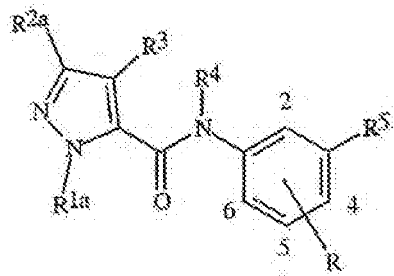
compound of Formula **Iz** wherein seed from which the crop is grown is treated with an antidotally effective amount of safener. Seed treatment with 1,8-naphthalic anhydride works well in a wide variety of crops such as maize, wheat, barley and sugarbeets. Of note is said method wherein the compound of Formula **Iz** is a compound of Formula **I**. Antidotally effective amounts of safeners can be easily determined by one skilled in the art through simple experimentation.

A compound of Formula **Iz** can thus be applied in admixture with other herbicides and/or herbicide safeners, in binary or multiple combinations in order to achieve optimal weed control spectrum and duration of weed control, suppress proliferation of resistant biotypes, benefit from synergy against particularly troublesome weeds and/or reduce injury to crops. Therefore an aspect of the present invention relates to a herbicidal mixture comprising a herbicidally effective amount of a compound of Formula **Iz**, an *N*-oxide or an agriculturally suitable salt thereof, and an effective amount of at least one additional active ingredient selected from the group consisting of an other herbicide and a herbicide safener. Typically the herbicidal mixture is applied in the form of a herbicidal composition comprising the herbicidal mixture and at least one of a surfactant, a solid diluent or liquid diluent. Related to this herbicidal mixture and herbicidal composition is a method for controlling the growth of undesired vegetation by applying a herbicidally effective amount of said herbicidal mixture or herbicidal composition to the locus of the undesired vegetation. Of note are said herbicidal mixture, herbicidal composition and method wherein the compound of Formula **Iz** is a compound of Formula **I**. Also of note are said herbicidal mixture, herbicidal composition and method wherein the compound of Formula **Iz** is selected from Formula **Iz** wherein: J is J-1, R^{1a} is Me, R^{2a} is *t*-Bu, R^3 is H, W is O, R^4 is H, T, U, Y and Z are CH, and R^5 is $C(O)NMe_2$; J is J-1, R^{1a} is Me, R^{2a} is *t*-Bu, R^3 is H, W is O, R^4 is H, T, U, Y and Z are CH, and R^5 is C(O)NHMe; J is J-1, R^{1a} is Me, R^{2a} is *t*-Bu, R^3 is H, W is O, R^4 is H, T, U, Y and Z are CH, and R^5 is C(O)NH-*n*-Pr; J is J-1, R^{1a} is Me, R^{2a} is *t*-Bu, R^3 is H, W is O, R^4 is H, T, U, Y and Z are CH, and R^5 is $C(O)NEt_2$; or J is J-1, R^{1a} is Me, R^{2a} is *t*-Bu, R^3 is H, W is O, R^4 is H, U, Y and Z are CH, T is N, and R^5 is $C(O)NEt_2$ (or the pyridine N-oxide thereof, i.e. T is N(O)).

The following Tests demonstrate the control efficacy of the compounds of this invention against specific weeds. The weed control afforded by the compounds is not limited, however, to these species. See Index Tables A–K for compound descriptions. The following abbreviations are used in the Index Tables which follow: *t* means tertiary, *s* means secondary, *n* means normal, *i* means iso, *c* means cyclo, Me means methyl, Et means ethyl, Pr means propyl, *i*-Pr means isopropyl, Bu means butyl, Ph means phenyl, OMe means methoxy, OEt means ethoxy, SMe means methylthio, SEt means ethylthio, CN means cyano, NO_2 means nitro, TMS means trimethylsilyl, S(O)Me means methylsulfinyl, and $S(O)_2Me$ means methylsulfonyl. The abbreviation "dec" indicates that the compound appeared to

decompose on melting. The abbreviation "Ex." stands for "Example" and is followed by a number indicating in which example the compound is prepared.

INDEX TABLE A



R can be one or more substituents; a dash ("–") indicates no substituents.

Compound	R^{1a}	R^{2a}	R^3	R^4	R	R^5	m.p. (°C)
1	Et	*t*-Bu	H	H	6-F	$C(O)N[CH_2CH{=}CHCH_2]$	*
2 (Ex. 5, 6)	Et	*t*-Bu	H	H	6-F	$C(O)NHCH_2CH_3$	188.5
3	Et	*t*-Bu	H	H	6-F	$C(O)NHCH_2CH_2F$	*
4	Et	*t*-Bu	H	H	6-F	$C(O)N(CH_2CH_3)_2$	*
5	Et	*t*-Bu	H	H	6-F	$C(O)NHCH_2CF_3$	*
6 (Ex. 7)	Et	*t*-Bu	H	H	6-F	$C(O)N(CH_3)_2$	**
7	Et	*t*-Bu	H	H	6-F	$C(O)NHCH_3$	250–252
8	Et	*t*-Bu	H	H	2,4,5-tri-F	$C(O)NHCH_2CH_3$	*
9	Et	*t*-Bu	H	H	6-F	$C(O)N(CH_3)CH_2CH{=}CH_2$	*
10	Et	*t*-Bu	H	H	6-F	$C(O)N(CH_3)CH_2C{\equiv}CH$	*
11	Et	*t*-Bu	H	H	6-F	$C(O)NHCH_2CH_2OCH_3$	*
12	Et	*t*-Bu	H	H	6-F	$C(O)N(CH_3)CH_2CH(CH_3)_2$	*
13	Et	*i*-Pr	H	H	6-F	$C(O)NHCH_2CH_3$	*
14	Et	*i*-Pr	H	H	6-F	$C(O)N(CH_3)_2$	*
15	Et	*i*-Pr	H	H	6-F	$C(O)N(CH_2CH_3)_2$	*
16	Et	*t*-Bu	H	H	6-F	$C(O)N(CH_3)CH_2CH_3$	*
17	Et	*t*-Bu	H	H	6-F	$C(O)N(CH_3)CH_2CH_2CH_3$	*
18	Et	*c*-Pr	H	H	6-F	$C(O)N(CH_3)_2$	*
19	Et	*c*-Pr	H	H	6-F	$C(O)N(CH_2CH_3)_2$	*
20	Et	*c*-Pr	H	H	6-F	$C(O)NHCH_2CH_3$	*
21	Et	*c*-Pr	H	H	6-F	$C(O)N(CH_3)CH_2CH{=}CH_2$	*
22	Et	*i*-Bu	H	H	6-F	$C(O)N(CH_3)_2$	*
23	Et	*i*-Bu	H	H	6-F	$C(O)N(CH_2CH_3)_2$	*
24	Et	*i*-Bu	H	H	6-F	$C(O)NHCH_2CH_3$	*
25	Et	*i*-Bu	H	H	6-F	$C(O)N(CH_3)CH_2CH{=}CH_2$	*

Compound	R^{1a}	R^{2a}	R^3	R^4	R	R^5	m.p. (°C)
26	Et	*t*-Bu	H	H	–	$C(O)N[CH(CH_3)(CH_2)_4]$	197–198
27	Et	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	176–179
28	Et	*t*-Bu	H	H	–	$C(O)N(CH_2CH_3)_2$	153–155
29	Et	*t*-Bu	H	H	–	$C(O)NHCH_3$	195–197
30	CH_2CF_3	*t*-Bu	H	H	–	$C(O)NHCH_3$	204–206
31	CH_2CF_3	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	*
32	CH_2CF_3	*t*-Bu	H	H	–	$C(O)N(CH_2CH_3)_2$	*
33	$CH{=}CH_2$	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	*
34	$CH{=}CH_2$	*t*-Bu	H	H	–	$C(O)N(CH_2CH_3)_2$	*
35	CH_2CH_2F	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	*
36	CH_2CH_2F	*t*-Bu	H	H	–	$C(O)N(CH_2CH_3)_2$	*
37	$CH{=}CH_2$	*t*-Bu	H	H	–	$C(O)NHCH_2CF_3$	*
38	$CH{=}CH_2$	*t*-Bu	H	H	–	$C(O)NHCH_2CH_2Cl$	*
39	$CH{=}CH_2$	*t*-Bu	H	H	–	C(O)NH(*c*-Pr)	*
40	*n*-Bu	*t*-Bu	H	H	–	$C(O)N(CH_2CH_3)_2$	154–156
41	*n*-Bu	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	139–141
42	*i*-Bu	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	*
43 (Ex. 3)	Et	*t*-Bu	H	H	–	$C(O)NHCH_2CF_3$	**
44	Et	*t*-Bu	H	H	–	C(O)NH(*c*-Pr)	*
45	Et	*t*-Bu	H	H	–	$C(O)NHCH_2CH_2F$	*
46	Et	*t*-Bu	H	H	–	$C(O)NHCH_2CH{=}CH_2$	*
47	Et	*t*-Bu	H	H	–	$C(O)NHCH_2C{\equiv}CH$	*
48	Et	*t*-Bu	H	H	–	$C(O)N(CH_3)CH_2CH_3$	*
49	Et	*t*-Bu	H	H	–	$C(O)N(CH_3)_2$	*
50	$CH_2C{\equiv}CH$	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	*
51	Et	*t*-Bu	H	H	–	C(O)NH(*i*-Pr)	*
52	Et	*t*-Bu	H	H		2-$[(CH_2)_2]$NHC(O)-	*
53	Me	*t*-Bu	H	H		2-$[(CH_2)_2]$NHC(O)-	*
54	Me	*t*-Bu	H	H		2-$[(CH_2)_2]$NMeC(O)-	*
55 (Ex. 15)	Et	*t*-Bu	H	H		2-$[(CH_2)_2]$NMeC(O)-	**
56	$CH_2CH{=}CH_2$	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	*
57	*n*-Pr	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	162–163
58	Et	*t*-Bu	H	H	4-F	$C(O)NHCH_2CH_3$	*
59	Et	*t*-Bu	H	H	4-F	$C(O)N(CH_2CH_3)_2$	*
60	Et	*t*-Bu	H	H	4-F	$C(O)NHCH_2CH_2F$	*
61	Et	*t*-Bu	H	H	–	C(O)NH(*i*-Bu)	*
62	Et	*t*-Bu	H	H	–	$C(O)NHCH_2$(*c*-Pr)	*

Compound	R^{1a}	R^{2a}	R^3	R^4	R	R^5	m.p. (°C)
63	Et	*t*-Bu	H	H	2-[(CH₂)₂]NEtC(O)-		*
64	Et	*t*-Bu	H	H	2-[(CH₂)₂]N(*c*-Pr)C(O)-		*
65	Et	*t*-Bu	H	H	2-[(CH₂)₂]N(*n*-Pr)C(O)-		*
66	Et	*t*-Bu	H	H	2-[(CH₂)₂]N(*c*-pentyl)C(O)-		*
67	Et	*t*-Bu	H	H	–	$C(O)NHOCH_3$	*
68	Et	*t*-Bu	H	H	4-CH_3	$C(O)NHCH_2CH_3$	*
69	Et	*t*-Bu	H	H	4-CH_3	$C(O)N(CH_2CH_3)_2$	*
70 (Ex. 4)	Et	*t*-Bu	H	H	6-F	$CO_2CH_2CH_3$	**
71	Et	*t*-Bu	H	H	6-F	CO_2(*t*-Bu)	*
72	Et	*i*-Bu	H	H	6-F	$CO_2CH_2CH_3$	*
73	Et	*i*-Pr	H	H	6-F	$CO_2CH_2CH_3$	*
74	Et	*c*-Pr	H	H	6-F	$CO_2CH_2CH_3$	*
75	Et	*t*-Bu	H	H	6-F, 4-OCH_3	CO_2CH_3	*
76	Et	*t*-Bu	H	H	6-F, 4-OCH_3	$CO_2CH_2CH_3$	*
77	Et	*t*-Bu	H	H	6-F, 4-OCH_3	CO_2(*i*-Pr)	*
78	$CH{=}CH_2$	*t*-Bu	H	H	–	$CO_2CH_2CH_3$	*
79	CH_2CH_2F	*t*-Bu	H	H	–	$CO_2CH_2CH_3$	*
80 (Ex. 1)	Et	*t*-Bu	H	H	–	$CO_2CH_2CH_3$	**
81	Et	*t*-Bu	H	H	–	CO_2CH_3	*
82 (Ex. 2)	Et	*t*-Bu	H	H	–	$CO_2CH_2CH_2F$	**
83	Et	*t*-Bu	H	H	–	$CO_2CH_2CF_3$	*
84	Et	*t*-Bu	H	H	–	$CO_2CH_2C{\equiv}CH$	*
85	Et	*t*-Bu	H	H	–	$CO_2CH_2CH{=}CH_2$	*
86	Et	*t*-Bu	H	H	–	$CO_2(CH_2)_3CH_3$	*
87	Et	*t*-Bu	H	H	2-CH_3	CO_2CH_3	*
88	Et	*t*-Bu	H	H	2-CH_3	$CO_2CH_2CH_3$	*
89	Et	*t*-Bu	H	H	4-F	$CO_2CH_2CH_3$	*
90	Et	*t*-Bu	H	H	2-CH_3	$CO_2(CH_2)_2CH_3$	*
91	Et	*t*-Bu	H	H	2-CH_3	$CO_2CH_2CH_2F$	*
92	Et	*t*-Bu	H	H	2-CH_3	CO_2(*i*-Pr)	*
93	Et	*t*-Bu	H	H	2-CH_3	CO_2CH_2(*c*-Pr)	*
94	Et	*t*-Bu	H	H	2-CH_3	$CO_2CH_2CH{=}CH_2$	*
95	Et	*t*-Bu	H	H	4-OEt	$CO_2CH_2CH_3$	*
96	Et	*t*-Bu	H	H	4-OMe	$CO_2CH_2CH_3$	*
97	Et	*t*-Bu	H	H	2-OMe	$CO_2CH_2CH_3$	*
98	Et	*t*-Bu	H	H	–	CO_2(*t*-Bu)	*
99	Et	*t*-Bu	H	H	4-CH_3	$CO_2CH_2CH_3$	*

Compound	R^{1a}	R^{2a}	R^3	R^4	R	R^5	m.p. (°C)
100	Et	*t*-Bu	H	H	4-CH_3	CO_2(*i*-Pr)	*
101	Et	*t*-Bu	H	H	4-OMe	CO_2(*i*-Pr)	*
102	Me	*t*-Bu	H	H	–	C(=NOH)CH_3	189–191
103	Me	CF_3	H	H	–	C(=NOH)CH_3	189–191
104	Me	*t*-Bu	H	H	6-OMe	C(=NOH)CH_3	196–197
105	Me	*t*-Bu	H	H	–	C(=$NOCH_2CH_3$)CH_3	94–95
106	Me	*t*-Bu	H	H	–	C(=$NOCH_3$)CH_3	125–126
107	Me	*t*-Bu	H	H	–	C(=NOH)CH_3	*
108	Et	*t*-Bu	H	H	–	C(=NOH)CH_3	172–174
109	Me	*t*-Bu	H	H	4-F	C(=NOH)CH_3	165–167
110	*i*-Pr	*t*-Bu	H	H	–	C(=NOH)CH_3	*
111	Me	*t*-Bu	H	H	2-[$(CH_2)_2$]C(=NOH)-		*
112	CH_2CF_3	*t*-Bu	H	H	–	C(=NOH)CH_3	145–147
113	*n*-Pr	*t*-Bu	H	H	–	C(=NOH)CH_3	173–175
114	CH=CH_2	*t*-Bu	H	H	–	C(=NOH)CH_3	*
115	CH_2CH_2F	*t*-Bu	H	H	–	C(=NOH)CH_3	*
116	Me	*t*-Bu	H	H	2-[$(CH_2)_3$]C(=NOH)-		*
117	CH_2CH=CH_2	*t*-Bu	H	H	–	C(=NOH)CH_3	*
118	Me	*t*-Bu	H	H	–	C(=NOH)CH_2CH_3	188–190
119	*n*-Bu	*t*-Bu	H	H	–	C(=NOH)CH_3	161–163
120	Me	*s*-Bu	H	H	–	C(=NOH)CH_3	139–141
121	Me	*t*-Bu	H	H	–	CN	95–99
122	Et	*t*-Bu	H	H	–	C(O)CH_3	106–108
123	Me	*t*-Bu	H	H	4-F	C(O)CH_3	124–127
124	Me	*t*-Bu	H	H	–	$S(O)_2NH$(*i*-Pr)	*
125	Me	*t*-Bu	H	H	–	$S(O)_2NH(CH_2)_3CH_3$	*
126	CH_2CF_3	*t*-Bu	H	H	–	C(O)CH_3	108–109
127	CH=CH_2	*t*-Bu	H	H	–	C(O)CH_3	*
128	CH_2CH_2F	*t*-Bu	H	H	–	C(O)CH_3	*
129	CH_2CH=CH_2	*t*-Bu	H	H	–	C(O)CH_3	*
130	Et	*t*-Bu	H	H	–	SCF_3	*
131	Et	*t*-Bu	H	H	–	SCH_3	*
132	CH_2CH_2F	*t*-Bu	H	H	–	SCF_3	*
133	Et	*t*-Bu	H	H	–	$S(O)_2CH_3$	*
134	Et	*t*-Bu	H	H	–	$S(O)_2CF_3$	*
135	Et	*t*-Bu	H	H	–	S(O)CF_3	*
136	Et	*t*-Bu	H	H	–	OCH_2CH_3	*

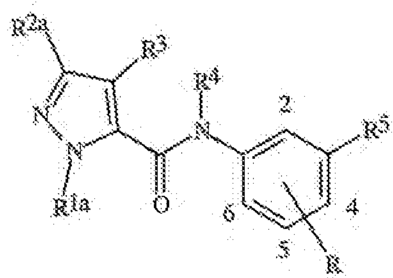
Compound	R^{1a}	R^{2a}	R^3	R^4	R	R^5	m.p. (°C)
137	Et	*t*-Bu	H	H	–	$O(CH_2)_3CH_3$	*
138	Et	*t*-Bu	H	H	–	$O(CH_2)_2CH_2F$	*
139	Et	*t*-Bu	H	H	–	CN	*
140	Et	*t*-Bu	H	H	6-F	CN	153–154
141	Et	*t*-Bu	H	C(O)Me	4-Me	$CO_2CH_2CH_3$	*
236 (Ex. 18)	Et	*t*-Bu	H	H	4-F	$C(O)N(CH_3)_2$	**
242	Et	*t*-Bu	H	H	6-F	$C(O)N\{CH_2CH_2CH_2CH_2\}$	*
243	Et	*t*-Bu	H	H	6-F	$C(O)N\{CH_2CH_2OCH_2CH_2\}$	*
244	Et	*t*-Bu	H	H	6-F	$C(O)N(CH_3)OCH_3$	*
248	Et	*t*-Bu	H	H	4,6-di-F	$CO_2(i\text{-Pr})$	*
249	Et	*t*-Bu	H	H	4,6-di-F	$CO_2CH_2CH_2CH_3$	*
250	Et	*t*-Bu	H	H	4,6-di-F	$CO_2CH_2CH_3$	*
251	Et	*t*-Bu	H	H	4,6-di-F	$C(O)NHCH_3$	*
252	Et	*t*-Bu	H	H	4,6-di-F	$C(O)NHCH_2CH_3$	*
253	Et	*t*-Bu	H	H	4,6-di-F	$C(O)N(CH_2CH_3)_2$	*
254	Et	*t*-Bu	H	H	4,6-di-F	$C(O)N(CH_3)CH_2CH_3$	*
270	Et	*t*-Bu	H	H	4,6-di-F	$C(O)N(CH_3)_2$	*
271	Et	*t*-Bu	H	H	6-F	$C(O)NH_2$	*
272	Et	*t*-Bu	H	H	–	OCF_3	*
273	Et	*t*-Bu	H	H	–	$OCH(CH_3)_2$	*
275	Et	*t*-Bu	F	H	6-F	$C(O)NHCH_2CH_3$	*
276 (Ex. 21)	Et	*t*-Bu	F	H	6-F	$C(O)N(CH_3)_2$	**
285	Et	*t*-Bu	H	H	–	$C(O)N(CH_3)CH_2CH{=}CH_2$	*
286	Et	*t*-Bu	H	H	–	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
294	Et	*t*-Bu	H	H	6-F	$C(S)N(CH_3)_2$	*
295	Et	1-Me-*c*-Pr	H	H	–	$CO_2CH_2CH_3$	*
296	Et	1-Me-*c*-Pr	H	H	6-F	$CO_2CH_2CH_3$	*
297	Et	*t*-Bu	H	H	$6\text{-}OCH_3$	OCH_3	*
298	Et	*t*-Bu	H	H	$4\text{-}OCH_3$	OCH_3	*
299	Et	1-Me-*c*-Pr	H	H	6-F	$C(O)N(CH_3)_2$	*
300	Et	1-Me-*c*-Pr	H	H	6-F	$C(O)NHCH_2CH_3$	*
301	Et	1-Me-*c*-Pr	H	H	6-F	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
302	Et	1-Me-*c*-Pr	H	H	6-F	$C(O)NHCH_2C{\equiv}CH$	*
303	Et	1-Me-*c*-Pr	H	H	–	$C(O)N(CH_3)_2$	*
304	Et	1-Me-*c*-Pr	H	H	–	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
306	Et	1-Me-*c*-Pr	H	H	–	$C(O)NHCH_2CH_3$	*
311	H	*t*-Bu	H	H	–	$C(=NOH)CH_3$	*

Compound	R^{1a}	R^{2a}	R^3	R^4	R	R^5	m.p. (°C)
329	Et	*t*-Bu	H	H	–	$C(O)NHCH_2SCH_2CH_3$	*
332	Et	*t*-Bu	H	H	–	$OCHF_2$	*
333	Et	*t*-Bu	H	H	–	OCF_2CHF_2	*
338	Et	*t*-Bu	H	H	6-F	OCF_3	*
347	Et	*t*-Bu	H	H	6-F	OCH_3	*
348	Et	*t*-Bu	H	H	6-F	OCH_2CH_3	*
349	Et	*t*-Bu	H	H	6-F	$C(S)NHCH_2CH_3$	*
350	Et	*t*-Bu	H	H	6-F	OCH_2CH_2F	*
351	H	*t*-Bu	H	H	–	$C(O)NHCH_2CH_3$	*

* See Index Table K for ^1H NMR data.

** See synthesis example for ^1H NMR data.

INDEX TABLE B



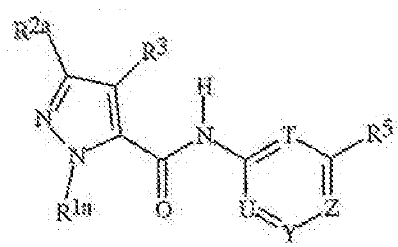
R can be one or more substituents; a dash ("–") indicates no substituents.

Compound	R^{1a}	R^{2a}	R^3	R^4	R	R^5	m.p. (°C)
352 (Ex. 25)	Et	$-(CH_3)_2C[(CH_2)_2]-$		H	6-F	$C(O)N(CH_3)_2$	**
353	Et	$-(CH_3)_2C[(CH_2)_2]-$		H	6-F	$C(O)NHCH_2CH_3$	*

* See Index Table K for ^1H NMR data.

** See synthesis example for ^1H NMR data.

INDEX TABLE C



Compound	R^{1a}	R^{2a}	R^3	T	U	Y	Z	R^5	m.p. (°C)
142	Et	*t*-Bu	H	CH	N	CH	CH	$C(O)N[CH_2CH=CHCH_2]$	*
143 (Ex. 8)	Et	*t*-Bu	H	N	CH	CH	CH	CO_2CH_3	**

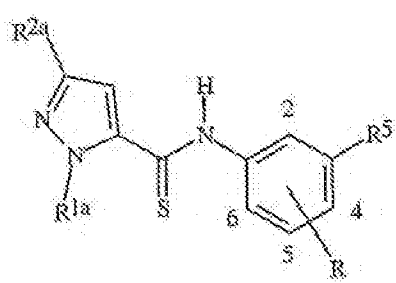
Compound	R^{1a}	R^{2a}	R^3	T	U	Y	Z	R^5	m.p. (°C)
144	Et	*t*-Bu	H	N	CH	CH	CH	$C(O)NHCH_2CH_3$	*
145	Et	*t*-Bu	H	N	CH	CH	CH	$C(O)N(CH_2CH_3)_2$	*
146	Et	*t*-Bu	H	N	CH	CH	CH	C(O)NH(*c*-Pr)	*
147	Et	*t*-Bu	H	N	CH	CH	CH	$C(O)NHCH_2C{\equiv}CH$	*
148	Et	*t*-Bu	H	CH	N	CCH_3	CH	CO_2CH_3	*
149	Et	*t*-Bu	H	CH	N	CCH_3	CH	$C(O)NHCH_2CH_3$	*
150	Et	*t*-Bu	H	N	CH	CCH_3	CH	$C(O)NHCH_2CH_3$	*
151 (Ex. 10)	Et	*t*-Bu	H	CH	N	CH	CH	CO_2CH_3	**
152	Et	*t*-Bu	H	CH	N	CH	CH	$C(O)NHCH_2CH_3$	*
153	Et	*t*-Bu	H	CH	N	CH	CH	$C(O)N(CH_2CH_3)_2$	*
154	Et	*t*-Bu	H	CH	N	CH	CH	C(O)NH(*i*-Bu)	*
155	Et	*t*-Bu	H	CH	N	CH	CH	$C(O)NHCH_2$(*c*-Pr)	*
156 (Ex. 11)	Et	*t*-Bu	H	CH	N	CH	CH	$C(O)N(CH_3)_2$	**
157	Et	*t*-Bu	H	CH	N	CH	CH	$CO_2CH_2CH_3$	*
158	Et	*t*-Bu	H	N	CH	CH	CH	$C(O)N(CH_3)CH_2CN$	*
159	Et	*t*-Bu	H	CH	N	CH	CH	$C(O)N(CH_3)CH_2CH{=}CH_2$	*
160	Et	*t*-Bu	H	CH	N	CH	CH	$C(O)N(CH_3)CH_2C{\equiv}CH$	*
161	Et	*t*-Bu	H	CH	N	CH	CH	$C(O)NH(CH_2)_2OCH_3$	*
162 (Ex. 9)	Et	*t*-Bu	H	N	CH	CH	CH	$C(O)N(CH_3)_2$	**
163	Et	*t*-Bu	H	N	CH	CH	CH	$C(O)N(CH_3)CH_2CH{=}CH_2$	*
164	Me	*t*-Bu	H	N	N	CH	CH	$C({=}NOH)CH_3$	196-197
165	Et	*t*-Bu	H	N	N	CH	CH	OCH_3	*
166	Et	*t*-Bu	H	N	N	$COCH_3$	CH	OCH_3	*
167	Et	*t*-Bu	H	N	N	$COCH_3$	CH	SCH_2F	*
245	Et	*t*-Bu	H	N	CH	CH	CH	$C(O)N\{CH_2CH_2CH_2CH_2\}$	*
246	Et	*t*-Bu	H	N	CH	CH	CH	$C(O)N(CH_3)OCH_3$	*
247	Et	*t*-Bu	H	N	CH	CH	CH	$C(O)N\{CH_2CH_2OCH_2CH_2\}$	*
255 (Ex. 19)	Et	*t*-Bu	H	CH	CH	N	CH	$CO_2CH_2CH_3$	**
256	Et	*t*-Bu	H	CH	CH	CH	N	$C(O)N(CH_3)_2$	*
257	Et	*t*-Bu	H	CH	CH	CH	N	$C(O)NHCH_2CH_3$	*
258	Et	*t*-Bu	H	CH	CH	N	CH	$C(O)N(CH_3)_2$	*
259	Et	*t*-Bu	H	CH	CH	N	CH	$C(O)NHCH_2CH_3$	*
260	Et	*t*-Bu	H	CH	CH	N	CH	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
261 (Ex. 20)	Et	*t*-Bu	H	CH	CH	N	CH	$C(O)N(CH_2CH_3)_2$	**
262	Et	*t*-Bu	H	CH	CH	N	CH	$C(O)N(CH_2CH{=}CH_2)_2$	*
263	Et	*t*-Bu	H	CH	CH	N	CH	$C(O)N(CH_3)CH_2CH_3$	*
264	Et	*t*-Bu	H	CH	CH	N	CH	$C(O)NHCH_2C{\equiv}CH$	*

Compound	R^{1a}	R^{2a}	R^3	T	U	Y	Z	R^5	m.p. (°C)
265	Et	*t*-Bu	H	N	$COCH_3$	CH	CH	CO_2CH_3	*
266	Et	*t*-Bu	H	N	$COCH_3$	CH	CH	$C(O)NHCH_2CH_3$	*
274	Et	*t*-Bu	F	N	CH	CH	CH	$C(O)N(CH_3)_2$	*
277	Et	*t*-Bu	H	N	CF	CH	CH	$C(O)N(CH_3)_2$	*
278	Et	*t*-Bu	H	N	CF	CH	CH	$C(O)NHCH_2CH_3$	*
279	Et	*t*-Bu	H	N	CF	CH	CH	$C(O)NHCH_2C{\equiv}CH$	*
280	Et	*t*-Bu	H	N	CF	CH	CH	$C(O)N(CH_3)CH_2CH_3$	*
281	Et	*t*-Bu	H	N	CF	CH	CH	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
282	Et	*t*-Bu	H	CH	CH	CH	N	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
283	Et	*t*-Bu	H	CH	CH	CH	N	$C(O)NHCH_2C{\equiv}CH$	*
284	Et	*t*-Bu	H	CH	CH	CH	N	$C(O)NHCH_2CH_2F$	*
287	Et	*t*-Bu	H	N	CH	N	CH	$C(O)N(CH_3)_2$	*
288	Et	*t*-Bu	H	N	CH	N	CH	$C(O)NHCH_2CH_3$	*
289	Et	*t*-Bu	H	N	CH	N	CH	$C(O)NHCH_2C{\equiv}CH$	*
290	Et	*t*-Bu	H	N	CH	N	CH	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
291	Et	*t*-Bu	H	N	CH	N	CH	$C(O)NHCH_2CF_3$	*
312	Me	*t*-Bu	H	N	CH	CH	CH	CO_2CH_3	*
313	Me	*t*-Bu	H	N	CH	CH	CH	$CO_2CH_2CH_3$	*
314	Me	*t*-Bu	H	N	CH	CH	CH	$C(O)N(CH_2CH_3)_2$	*
315	Me	*t*-Bu	H	N	CH	CH	CH	C(O)NH(*c*-Pr)	*
316	Me	*t*-Bu	H	N	CH	CH	CH	$C(O)NHCH_2C{\equiv}CH$	*
317	Me	*t*-Bu	H	N	CH	CH	CH	$CO_2CH_2C{\equiv}CH$	*
318	Me	*t*-Bu	H	N	CH	CH	CH	$C(O)NHCH_2CH{=}CH_2$	*
334	Et	*t*-Bu	H	CH	N	CH	CH	$C(S)N(CH_3)_2$	170–172

* See Index Table K for ^1H NMR data.

** See synthesis example for ^1H NMR data.

INDEX TABLE D

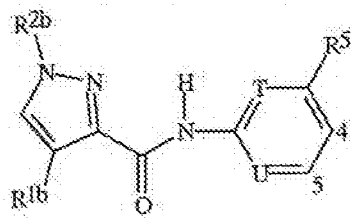


R can be one or more substituents; a dash ("–") indicates no substituents.

Compound	R^{1a}	R^{2a}	R	R^5	m.p. (°C)
305	Et	*t*-Bu	6-F	$C(S)N(CH_3)_2$	90–92
346	Et	*t*-Bu	6-F	$CO_2CH_2CH_3$	*

* See Index Table K for ^{1}H NMR data.

INDEX TABLE E

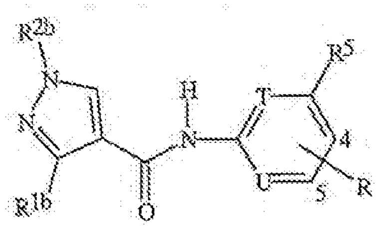


Compound	R^{1b}	R^{2b}	T	U	R^5	m.p. (°C)
168 (Ex. 12)	Et	*t*-Bu	CH	CH	$C(O)N(CH_2CH_3)_2$	**
169	CF_3	*t*-Bu	CH	CH	$C(O)N(CH_2CH_3)_2$	*
170	CF_3	*t*-Bu	CH	CH	$C(O)NHCH_2CH_3$	*
171	CF_3	*t*-Bu	CH	CH	$C(=NOH)CH_3$	*
218	Cl	*t*-Bu	CH	CH	$C(O)N(CH_2CH_3)_2$	*
219	Cl	*t*-Bu	CH	CH	$C(O)NHCH_2CH_3$	*
220	Br	*t*-Bu	CH	CH	$C(O)N(CH_2CH_3)_2$	*
221 (Ex. 14)	Br	*t*-Bu	CH	CH	$C(O)NHCH_2CH_3$	**
232	Et	*t*-Bu	CH	N	$C(O)N(CH_3)_2$	163–165
233	Et	*t*-Bu	CH	N	$C(O)NHCH_2CH_3$	141–143
234	Et	*t*-Bu	CH	N	$C(O)N(CH_2CH_3)_2$	90–91
235	Et	*t*-Bu	CH	N	$C(O)N(CH_3)CH_2CH_3$	103–105
330	Et	*t*-Bu	N	CH	$C(O)N(CH_3)_2$	159–160

* See Index Table K for ^{1}H NMR data.

** See synthesis example for ^{1}H NMR data.

INDEX TABLE F



R can be one or more substituents; a dash ("–") indicates no substituents.

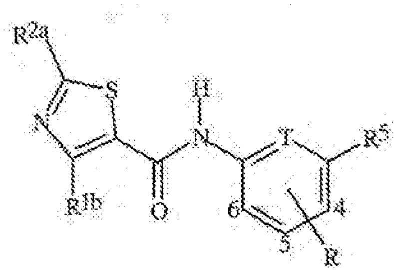
Compound	R^{1b}	R^{2b}	T	U	R	R^5	m.p. (°C)
172	CF_3	Et	CH	CH	–	$C(O)NHCH_2CH_3$	*

Compound	R^{1b}	R^{2b}	T	U	R	R^5	m.p. (°C)
179	Me	*i*-Pr	CH	CH	—	$C(O)CH_3$	116–118
180	Me	*i*-Pr	CH	CH	—	$C(=NOH)CH_3$	192–193
181	Et	*t*-Bu	CH	CH	—	$C(O)NHCH_2CH_3$	160–163
182 (Ex. 13)	Et	*t*-Bu	CH	CH	—	$C(O)N(CH_2CH_3)_2$	**
183	Me	*t*-Bu	CH	CH	—	$C(O)NHCH_2CH_3$	*
184	Me	*t*-Bu	CH	CH	—	$C(O)N(CH_2CH_3)_2$	*
185	*n*-Pr	*t*-Bu	CH	CH	—	$C(O)N(CH_2CH_3)_2$	*
186	Et	*t*-Bu	CH	CH	—	$CO_2CH_2CH_3$	*
187	Et	*t*-Bu	CH	CH	—	$C(O)CH_3$	*
188	Et	*t*-Bu	CH	CH	—	$C(=NOH)CH_3$	*
189	Me	*t*-Bu	CH	CH	—	O(*i*Pr)	*
190	Me	*t*-Bu	CH	CH	—	OCH_2CH_3	*
191	CF_3	*t*-Bu	CH	CH	—	$C(O)N(CH_2CH_3)_2$	*
192	CF_3	*t*-Bu	CH	CH	—	$C(O)NHCH_2CH_3$	*
193	Et	*t*-Bu	CH	CF	—	$C(O)NHCH_2CH_3$	*
194	Et	*t*-Bu	CH	CF	—	$C(O)NHCH_3$	*
222 (Ex. 16)	Et	*t*-Bu	CH	CF	—	$C(O)N(CH_3)_2$	**
223	Et	*t*-Bu	CH	CF	—	$C(O)N(CH_2CH_3)_2$	179–180
224	Et	*t*-Bu	CH	CF	—	$C(O)N(CH_3)CH_2CH_3$	138–139
238	Et	*t*-Bu	CH	N	—	$CO_2CH_2CH_3$	*
239	Et	*t*-Bu	CH	CH	4-F	$C(O)N(CH_3)_2$	170–171
240	Et	*t*-Bu	CH	CH	4-F	$C(O)N(CH_2CH_3)_2$	163–165
241 (Ex. 17)	Et	*t*-Bu	CH	CH	4-F	$C(O)NHCH_2CH_3$	**
292	Et	*t*-Bu	N	CH	—	$C(O)N(CH_3)_2$	148–149
293	Et	*t*-Bu	CH	N	—	$C(O)N(CH_3)_2$	150–151
344	Me	*t*-Bu	CH	CH	6-F	$C(O)N(CH_3)_2$	201–202
345	Me	*t*-Bu	CH	CH	6-F	$C(O)NHCH_2CH_3$	203–204

* See Index Table K for ^{1}H NMR data.

** See synthesis example for ^{1}H NMR data.

INDEX TABLE G

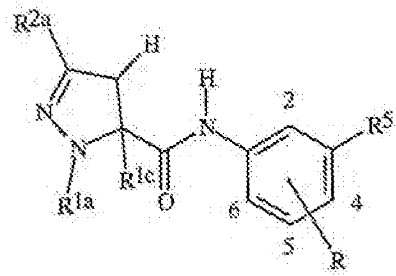


R can be one or more substituents; a dash ("–") indicates no substituents.

Compound	R^{1b}	R^{2a}	T	R	R^5	m.p. (°C)
195	Me	*t*-Bu	CH	–	$C(=NOH)CH_3$	*
196	Me	*t*-Bu	CH	–	$C(O)CH_3$	*
197	Me	*t*-Bu	CH	–	CO_2CH_3	*
198	Me	*t*-Bu	CH	–	$C(O)NHCH_2CH_3$	*
199	Me	*t*-Bu	CH	–	$C(O)N(CH_2CH_3)_2$	*
200	Me	*t*-Bu	CH	–	$C(O)NHCH_2CH_2F$	*
201	Me	*t*-Bu	CH	–	$C(O)NHCH_2CF_3$	*
202	Me	*t*-Bu	CH	–	$C(O)NHCH_2CH{=}CH_2$	*
203	Me	*t*-Bu	CH	–	$C(O)NHCH_2C{\equiv}CH$	*
204	Et	*t*-Bu	CH	–	$CO_2CH_2CH_3$	*
205	Et	*t*-Bu	CH	–	$C(O)N(CH_2CH_3)_2$	*
206	Et	*t*-Bu	CH	–	$C(O)NHCH_2CF_3$	*
207	Et	*t*-Bu	CH	–	$C(O)NHCH_2CH{=}CH_2$	*
209	Et	*t*-Bu	CH	–	$C(O)NHCH_2CH_2F$	*
210	Et	*t*-Bu	CH	–	$C(O)NHCH_2CH_3$	*
211	Et	*t*-Bu	CH	–	C(O)NH(*t*-Bu)	*
212	Et	*t*-Bu	CH	–	$C(O)NHCH_2$(*c*-Pr)	*
213	Et	*t*-Bu	N	–	$C(O)NHCH_2CH_3$	*
214	Et	*t*-Bu	N	–	$C(O)N(CH_2CH_3)_2$	*
215	Et	*t*-Bu	N	–	$C(O)NHCH_2$(*c*-Pr)	*
216	Et	*t*-Bu	N	–	C(O)NH(*t*-Bu)	*
217	Et	*t*-Bu	N	–	$C(O)NHCH_2C{\equiv}CH$	*
225	Et	*t*-Bu	CH	6-F	$C(O)N(CH_3)_2$	*
226	Et	*t*-Bu	CH	6-F	$C(O)NHCH_2CH_3$	*
227	Me	*t*-Bu	CH	–	$C(O)N(CH_3)CH_2CH_3$	*
228	Et	*t*-Bu	CH	–	$C(O)N(CH_3)_2$	*
229	Et	*t*-Bu	CH	–	$C(O)N(CH_3)CH_2CH_3$	*
230	Et	*t*-Bu	CH	6-F	$C(O)N(CH_2CH_3)_2$	*
231	Et	*t*-Bu	CH	6-F	$C(O)N(CH_3)CH_2CH_3$	*
237	*t*-Bu	Et	CH	6-F	$C(O)NHCH_2CH{=}CH_2$	*
319	Et	*t*-Bu	CH	–	$C(O)NHCH_2C{\equiv}CH$	*
326	Me	*t*-Bu	CH	–	$C(O)N(CH_3)_2$	*
327	*t*-Bu	Et	CH	6-F	$C(O)N(CH_2CH{=}CH_2)_2$	*

* See Index Table K for ^1H NMR data.

INDEX TABLE H



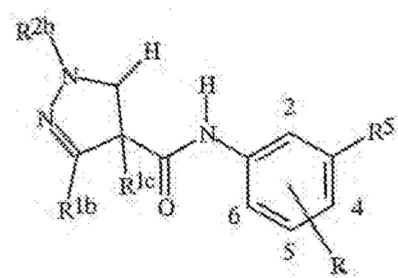
R can be one or more substituents; a dash ("–") indicates no substituents.

Compound	R^{1a}	R^{2a}	R^{1c}	R	R^5	m.p. (°C)
267 (Ex. 22)	Et	*t*-Bu	H	6-F	$CO_2CH_2CH_3$	**
268 (Ex. 23)	Et	*t*-Bu	H	6-F	$C(O)N(CH_3)_2$	**
269	Et	*t*-Bu	H	6-F	$C(O)NHCH_2CH_3$	*
307	Et	*t*-Bu	H	6-F	$C(O)N(CH_3)CH_2CH_3$	*
308	Et	*t*-Bu	H	6-F	$C(O)N(CH_2CH_3)_2$	*
309	Et	*t*-Bu	H	6-F	$C(O)N\{CH_2CH_2CH_2CH_2\}$	*
310	Et	*t*-Bu	H	6-F	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
331	Et	*t*-Bu	H	6-F	$C(O)N\{CH_2CH_2CH_2CH_2CH_2\}$	*

* See Index Table K for ^{1}H NMR data.

** See synthesis example for ^{1}H NMR data.

INDEX TABLE I



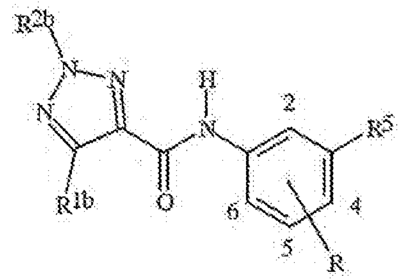
R can be one or more substituents; a dash ("–") indicates no substituents.

Compound	R^{1b}	R^{2b}	R^{1c}	R	R^5	m.p. (°C)
335	Et	*t*-Bu	H	6-F	$CO_2CH_2CH_3$	*
336 (Ex. 24)	Et	*t*-Bu	H	6-F	$C(O)NHCH_2CH_3$	**
340	Et	*t*-Bu	H	6-F	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
341	Et	*t*-Bu	H	6-F	$C(O)N\{CH_2CH_2CH_2CH_2\}$	*
342	Et	*t*-Bu	H	6-F	$C(O)N(CH_3)CH_2CH_3$	*
343	Et	*t*-Bu	H	6-F	$C(O)N(CH_3)_2$	*

* See Index Table K for ^{1}H NMR data.

** See synthesis example for ^{1}H NMR data.

INDEX TABLE J



R can be one or more substituents; a dash ("–") indicates no substituents.

Compound	R^{1b}	R^{2b}	R	R^5	m.p. (°C)
354	Et	*c*-pentyl	–	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
355	Et	*c*-pentyl	–	$C(O)N(CH_3)_2$	*
356	Et	*c*-pentyl	–	$C(O)NHCH_2CH_3$	*
357	Et	*i*-Pr	–	$C(O)NHCH_2CH_3$	*
358 (Ex. 27)	Et	*i*-Pr	–	$C(O)N(CH_3)_2$	**
359	Et	*i*-Pr	–	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
360 (Ex. 28)	Et	*t*-Bu	–	$CO_2CH_2CH_3$	**
361	Et	*t*-Bu	6-F	$C(O)N(CH_3)_2$	*
362	Et	*t*-Bu	6-F	$C(O)NCH_2CH_3$	*
363	Et	*t*-Bu	6-F	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
364	Et	*t*-Bu	–	$C(O)N(CH_3)_2$	*
365 (Ex. 29)	Et	*t*-Bu	–	$C(O)NCH_2CH_3$	**
366	Et	*t*-Bu	–	$C(O)N\{CH_2CH{=}CHCH_2\}$	*
367 (Ex. 26)	Et	*i*-Pr	–	$CO_2CH_2CH_3$	**

* See Index Table K for ^1H NMR data.

** See synthesis example for ^1H NMR data.

INDEX TABLE K

Cmpd No.	^1H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
1	δ 8.56 (dd, 1H), 8.00 (br s, 1H, NH), 7.24 (m, 2H), 6.54 (s, 1H), 5.92 (m, 1H), 5.82 (m, 1H), 4.57 (q, 2H), 4.42 (m, 2H), 4.20 (m, 2H), 1.42 (t, 3H), 1.28 (s, 9H).
3	δ 8.82 (m, 1H), 7.92 (br s, 1H, NH), 7.62 (m, 1H), 7.24 (s, 1H), 6.56 (br s, 1H, NH), 6.42 (s, 1H), 4.56 (m, 4H), 3.78 (m, 2H), 1.46 (t, 3H), 1.33 (s, 9H).
4	δ 8.42 (m, 1H), 7.92 (br s, 1H, NH), 7.24 (m, 2H), 6.42 (s, 1H), 4.52 (q, 2H), 3.42 (m, 4H), 1.46 (m, 6H), 1.30 (s, 9H).
5	δ 8.80 (m, 1H), 7.92 (br s, 1H, NH), 7.64 (m, 1H), 7.24 (m, 1H), 6.56 (t, 1H, NH), 6.51 (s, 1H), 4.56 (q, 2H), 4.06 (m, 2H), 1.46 (t, 3H), 1.33 (s, 9H).
8	δ 8.20 (m, 1H), 8.12 (s, 1H), 8.08 (br s, 1H), 6.57 (s, 1H), 6.30 (s, 1H), 3.50 (m, 2H), 1.51 (t, 3H), 1.43 (t, 3H), 1.33 (s, 9H), 1.25 (t, 3H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
9	δ 8.40 (dd, 1H), 8.14 (br s, 1H, NH), 7.22 (m, 2H), 6.56 (s, 1H), 5.86 (m, 1H), 5.28 (m, 2H), 4.58 (q, 2H), 3.08 (s, 3H), 1.44 (t, 3H), 1.34 (s, 9H).
10	δ 8.52 (dd, 1H), 7.92 (br s, 1H, NH), 7.22 (m, 2H), 6.58 (s, 1H), 4.60 (q, 2H), 4.02 (m, 2H), 3.20 (s, 3H), 2.40 (s, 1H), 1.44 (t, 3H), 1.34 (s, 9H).
11	δ 8.68 (dd, 1H), 7.84 (br s, 1H, NH), 7.62 (m, 1H), 7.24 (m, 1H), 6.60 (s, 1H, NH), 6.49 (s, 1H), 4.60 (q, 2H), 3.62 (m, 4H), 3.39 (s, 3H), 1.44 (t, 3H), 1.34 (s, 9H).
12	δ 8.40 (dd, 1H), 8.00 (br s, 1H, NH), 7.24 (m, 2H), 6.56 (s, 1H), 4.60 (q, 2H), 3.42 (m, 2H), 3.00 (s, 3H), 1.44 (t, 3H), 1.34 (m, 1H), 1.28 (s, 9H), 1.00 (d, 6H).
13	δ 8.62 (dd, 1H), 7. 92 (br s, 1H, NH), 7.66 (m, 1H), 7.24 (m, 1H), 6.48 (s, 1H), 6.32 (br s, 1H, NH), 4.56 (q, 4H), 3.48 (q, 2H), 3.00 (m, 1H), 1.31 (t, 3H), 1.28 (t, 3H), 1.24 (d, 6H).
14	δ 8.40 (dd, 1H), 8.00 (br s, 1H, NH), 7.18(m, 2H), 6.51 (s, 1H), 4.56 (q, 2H), 3.10 (s, 3H), 3.08 (m, 1H), 3.03 (s, 3H), 1.41 (t, 3H), 1.24 (d, 6H).
15	δ 9.00 (s, 1H, NH), 8.60 (dd, 1H), 7.12 (m, 2H), 6.55 (s, 1H), 4.16 (q, 2H), 3.42 (m, 4H), 3.03 (m, 1H), 1.41 (t, 3H), 1.24 (d, 6H).
16	δ 8.40 (br s, 1H), 8.20 (m, 1H), 7.20 (dd, 2H), 6.52 (s, 1H), 4.57 (q, 2H), 3.40 (m, 2H), 3.00 (s, 3H), 1.44 (t, 6H), 1.34 (s, 9H).
17	δ 8.38 (dd, 1H), 8.02 (br s, 1H, NH), 7.12 (m, 2H), 6.60 (s, 1H), 4.57 (q, 2H), 3.60 (t, 2H), 3.20 (t, 3H), 3.00 (s, 3H), 1.60 (m, 2H) 1.44 (t, 6H), 1.34 (s, 9H).
18	δ 8.40 (dd, 1H), 8.04 (br s, 1H, NH), 7.18(m, 2H), 6.41 (s, 1H), 4.56 (q, 2H), 3.10 (s, 3H), 3.08 (m, 1H), 3.03 (s, 3H), 1.96 (m, 1H) 1.34 (t, 3H), 0.94 (m, 4H).
19	δ 8.34 (dd, 1H), 8.06 (br s, 1H, NH), 7.18(m, 2H), 6.41 (s, 1H), 4.56 (q, 2H), 3.40 (m, 4H), 1.96 (m, 1H) 1.34 (t, 3H), 1.24 (m, 6H) 0.94 (m, 4H).
20	δ 8.82 (dd, 1H), 8.00 (br s, 1H, NH), 7.18(m, 2H), 6.41 (s, 1H), 6.24 (br s, 1H, NH) 4.56 (q, 2H), 3.42 (q, 2H), 1.96 (m, 1H) 1.34 (t, 3H), 1.26 (t, 3H), 0.98 (m, 2H), 0.80 (m, 2H).
21	δ 8.36 (br s, 1H, NH), 8.20 (dd, 1H), 7.12(m, 2H), 6.42 (s, 1H), 5.80 (m, 1H), 5.24 (m, 2H), 4.56 (q, 2H), 4.16 (m, 2H), 3.10 (s, 3H), 1.98 (m, 1H) 1.42 (t, 3H), 1.26 (t, 3H) 0.94 (m, 2H), 0.80 (m, 2H).
22	δ 9.00 (br s, 1H, NH), 8.62 (dd, 1H), 7.18(m, 2H), 6.56 (s, 1H), 4.18 (q, 2H), 3.10 (s, 3H), 3.06 (s, 3H), 2.42 (d, 2H), 1.98 (m, 1H) 1.46 (t, 3H), 0.98 (d, 6H).
23	δ 9.00 (br s, 1H, NH), 8.60 (dd, 1H), 7.18(m, 2H), 6.52 (s, 1H), 4.14 (q, 2H), 3.40 (m, 4H), 2.44 (d, 2H), 1.98 (m, 1H) 1.46 (t, 3H), 1.20 (t, 6H), 0.98 (d, 6H).
24	δ 9.04 (br s, 1H, NH), 8.78 (dd, 1H), 7.62 (m, 1H), 7.20 (t, 1H), 6.60 (s, 1H), 6.42 (br s, 1H, NH), 4.18 (q, 2H), 3.62 (q, 2H), 2.46 (d, 2H), 1.98 (m, 1H) 1.48 (t, 3H), 1.22 (t, 3H), 1.02 (d, 6H).
25	δ 9.00 (br s, 1H, NH), 8.60 (dd, 1H), 7.62 (m, 1H), 7.20 (m, 2H), 6.60 (s, 1H), 5.82 (m, 1H), 5.28 (m, 2H), 4.12 (q, 2H), 3.00 (s, 3H), 2.52 (d, 2H), 1.98 (m, 1H) 1.48 (t, 3H), 1.00 (d, 6H).
31	δ 8.60 (1H, NH), 8.00 (d, 1H), 7.90 (dd, 1H), 7.40 (m, 2H), 6.71 (s, 1H), 6.20 (t, 1H, NH), 5.22 (m, 2H), 3.42 (m, 2H), 1.35 (s, 9H), 1.22 (t, 3H).
32	δ 9.23 (1H, NH), 7.64 (dd, 1H), 7.30 (m, 2H), 7.23 (dd, 1H), 6.91 (s, 1H), 5.33 (m, 2H), 3.62 (q, 2H), 3.20 (q, 2H), 1.35 (s, 9H), 1.22 (t, 3H), 1.10 (t, 3H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
33	δ 9.00 (1H, NH), 8.00 (m, 2H), 7.45 (m, 2H), 6.71 (s, 1H), 6.42 (t, 1H, NH), 5.82 (d, 1H), 3.46 (q, 2H), 1.36 (t, 3H), 1.28 (s, 9H).
34	δ 9.20 (1H, NH), 8.00 (m, 1H), 7.60 (dd, 1H), 7.20 (m, 2H), 6.91 (dd, 1H), 6.87 (s, 1H), 5.82 (d, 1H), 3.56 (q, 2H), 3.20 (q, 2H), 1.35 (s, 9H), 1.22 (t, 6H).
35	δ 8.80 (s, 1H, NH), 8.00 (d, 1H), 7.90 (d, 1H), 7.42 (m, 2H), 6.70 (s, 1H), 6.40 (br s, 1H, NH), 4.82 (m, 4H), 4.18 (m, 2H), 1.31 (s, 9H), 1.18 (t, 3H).
36	δ 9.20 (s, 1H, NH), 7.70 (dd, 1H), 7.32 (m, 2H), 6.92 (dd, 1H), 6.80 (s, 1H), 4.82 (m, 4H), 3.48 (m, 4H), 1.31 (s, 9H), 1.25 (t, 6H).
37	δ 8.20 (br s, 1H, NH), 7.86 (m, 3H), 7.45 (dd, 1H), 7.40 (t, 1H), 6.45 (s, 1H), 5.82 (d, 1H), 5.00 (d, 1H), 4.06 (m, 2H), 1.28 (s, 9H).
38	δ 8.06 (m, 3H), 7.45 (m, 2H), 6.55 (s, 1H), 5.87 (d, 1H), 5.00 (d, 1H), 3.86 (m, 4H), 1.28 (s, 9H).
39	δ 8.26 (br s, 1H, NH), 7.86 (m, 3H), 7.45 (m, 2H), 6.65 (s, 1H), 6.40 (br s, 1H, NH), 5.82 (d, 1H), 5.00 (d, 1H), 2.80 (m, 1H), 1.28 (s, 9H), 0.90 (m, 2H), 0.60 (m, 2H).
44	δ 7.44 (m, 3H), 7.12 (dd, 1H), 6.76 (s, 1H), 4.60 (q, 2H), 2.86 (m, 1H), 1.42 (t, 3H), 1.38 (s, 9H), 0.86 (m, 2H), 0.68 (m, 2H).
45	δ 7.44 (m, 3H), 7.12 (dd, 1H), 6.70 (s, 1H), 4.60 (m, 4H), 3.82 (m, 2H), 1.42 (t, 3H), 1.38 (s, 9H).
46	δ 7.42 (m, 3H), 7.10 (dd, 1H), 6.80 (s, 1H), 6.52 (s, 1H, NH), 5.92 (m, 1H), 5.20 (m, 2H), 4.60 (m, 2H), 4.02 (m, 2H), 1.42 (t, 3H), 1.38 (s, 9H).
47	δ 7.42 (m, 3H), 7.10 (dd, 1H), 6.80 (s, 1H), 6.52 (s, 1H, NH), 4.60 (m, 2H), 4.20 (m, 2H), 2.20 (m, 1H), 1.42 (t, 3H), 1.38 (s, 9H).
48	(Acetone-d_6) δ 1.18 (t, 3H), 1.3 (s, 9H), 1.4 (t, 3H), 3.0 (s, 3H), 3.4 (m, 2H), 4.5 (q, 2H), 6.9 (s, 1H), 7.1 (t, 1H), 7.4 (d, 1H), 7.8 (d, 1H), 7.9 (s, 1H), 9.5 (br s, 1H).
49	(Acetone-d_6) δ 1.29 (s, 9H), 1.39 (t, 3H), 3.0 (m, 6H), 4.5 (q, 2H), 6.8 (s, 1H), 7.1 (d, 1H), 7.4 (t, 1H), 7.8 (d, 1H), 7.9 (s, 1H), 9.5 (br s, 1H).
50	(DMSO-d_6) δ 1.13 (t, 3H), 1.29 (s, 9H), 3.3 (q, 2H), 5.31 (d, 2H), 7.0 (s, 1H), 7.4 (t, 1H), 7.59 (d, 1H), 7.89 (d, 1H), 8.16 (s, 1H), 8.47 (t, 1H), 10.3 (br s, 1H).
51	δ 7.82 (s, 1H), 7.80 (dd, 1H), 7.62 (s, 1H, NH), 7.40 (m, 2H), 6.48 (s, 1H), 6.00 (s, 1H, NH), 4.58 (q, 2H), 4.24 (m, 1H), 1.42 (t, 3H), 1.38 (s, 9H), 1.26 (d, 3H), 1.20 (d, 3H).
52	δ 8.02 (d, 1H), 7.72 (d, 1H), 7.50 (s, 1H), 7.42 (t, 1H), 6.45 (s, 1H), 6.05 (s, 1H), 4.56 (q, 2H), 3.58 (m, 2H), 2.95 (t, 2H), 1.44 (t, 3H), 1.34 (s, 9H).
53	δ 8.02 (d, 1H), 7.68 (d, 1H), 7.65 (s, 1H), 7.40 (t, 1H), 6.54 (s, 1H), 6.28 (s, 1H), 4.15 (s, 3H), 3.56 (d of t, 1H), 2.94 (t, 2H), 1.34 (s, 9H).
54	δ 7.85 (d, 1H), 7.57 (t, 1H), 7.39 (d, 1H), 6.22 (s, 1H), 4.29 (s, 1H), 3.99 (s, 3H), 3.18 (s, 2H), 1.22 (s, 9H).
56	(Acetone-d_6) δ 1.2 (t, 3H), 1.30 (s, 9H), 3.4 (q, 2H), 5.0–5.1 (m, 1H), 5.17 (dd, 2H), 6.0–6.1 (m, 1H), 6.96 (s, 1H), 7.4 (t, 1H), 7.6 (d, 1H), 7.7 (br s, 1H), 7.9 (d, 1H), 8.2 (s, 1H), 9.5 (br s, 1H).
58	δ 8.20 (m, 1H), 7.96 (m, 1H), 7.80 (br s, 1H, NH), 7.20 (m, 1H), 6.49 (s, 1H), 4.62 (q, 2H), 3.50 (q, 2H), 1.42 (t, 3H), 1.32 (s, 9H), 1.26 (t, 3H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
59	δ 9.32 (br s, 1H, NH), 7.66 (m, 1H), 7.18 (dd, 1H), 7.00 (t, 1H), 6.69 (s, 1H), 4.62 (q, 2H), 3.60 (q, 2H), 3.34(q, 2H), 1.42 (t, 6H), 1.32 (s, 9H), 1.26 (t, 3H).
60	δ 8.30 (br s, 1H, NH), 8.16 (m, 1H), 7.90 (m, 1H), 7.20 (t, 1H), 6.59 (s, 1H), 4.62 (m, 4H), 3.80 (m, 2H), 1.42 (t, 3H), 1.32 (s, 9H).
61	δ 8.32 (s, 1H, NH), 7.86 (m, 2H), 7.58 (m, 2H), 6.58 (s, 1H), 6.30 (s, 1H, NH), 4.58 (q, 2H), 3.24 (t, 2H), 1.92 (m, 1H), 1.42 (t, 3H), 1.31 (s, 9H), 0.96 (d, 6H).
62	δ 8.38 (s, 1H, NH), 7.86 (m, 2H), 7.58 (m, 2H), 6.58 (s, 1H), 6.30 (s, 1H, NH), 4.58 (q, 2H), 3.28 (m, 2H), 1.92 (m, 1H), 1.42 (t, 3H), 1.31 (s, 9H), 1.00 (m, 1H), 0.66 (m, 2H), 0.32 (m, 2H).
63	δ 7.78 (s, 1H), 7.73 (d, 1H), 7.58 (d, 1H), 7.58 (t, 1H), 6.53 (s, 1H), 4.57 (q, 2H), 4.43 (s, 2H), 3.67 (d, 2H), 1.45 (t, 3H), 1.34 (s, 9H) 1.27 (t, 3H).
64	δ 7.72 (d, 1H), 7.69 (s, 1H), 7.57 (d, 1H), 7.58 (t, 1H), 6.53 (s, 1H), 4.57 (q, 2H), 4.37 (s, 2H), 2.94 (m, 1H), 1.45 (t, 3H), 1.34 (s, 9H) 0.97 (m, 2H).
65	δ 7.80 (s, 1H), 7.73 (d, 1H), 7.71 (d, 1H), 7.47 (t, 1H), 6.54 (s, 1H), 4.59 (q, 2H), 4.42 (s, 2H), 3.58 (t, 2H), 1.66 (m, 2H), 1.45 (t, 3H), 1.35 (s, 9H), 0.95 (t, 3H).
66	δ 7.75 (d, 1H), 7.66 (s, 1H), 7.55 (d, 1H), 7.48 (t, 1H), 6.52 (s, 1H), 4.76 (m, 1H), 4.57 (q, 2H), 4.39 (s, 2H), 2.00 (m, 2H), 2.70 (m, 6H), 1.45 (t, 3H), 1.35 (s, 9H).
67	δ 9.58 (s, 1H), 7.87 (s, 1H), 7.86 (d, 1H), 7.15 (t, 1H), 6.71 (s, 1H), 4.34 (q, 2H), 3.62 (s, 3H), 1.12 (t, 3H), 1.11 (s, 9H).
68	δ 9.24 (s, 1H), 7.57 (s, 1H), 7.55 (d, 1H), 7.04 (d, 1H), 6.70 (s, 1H), 6.70 (br s, 1H), 4.45 (q, 2H), 3.33 (q, 2H), 2.28 (s, 3H), 1.30 (t, 3H), 1.22 (t, 3H), 1.12 (s, 9H).
69	δ 8.23 (s, 1H), 7.58 (d, 1H), 7.22 (s, 1H), 7.17 (d, 1H), 6.62 (s, 1H), 4.56 (q, 2H), 3.8–3.6 (br m, 2H), 3.16 (br q, 2H), 2.20 (s, 3H), 1.43 (t, 3H), 1.33 (s, 9H), 1.25 (t, 3H), 1.06 (t, 3H).
71	δ 8.86 (dd, 1H), 7.80 (m, 1H), 7.16 (m, 1H), 6.42 (s, 1H), 4.58 (q, 2H), 1.51 (s, 9H), 1.42 (t, 3H), 1.32 (s, 9H).
72	δ 9.04 (br s, 1H, NH), 8.78 (dd, 1H), 7.62 (m, 1H), 7.20 (t, 1H), 6.60 (s, 1H), 4.18 (q, 2H), 2.46 (d, 2H), 1.98 (m, 1H) 1.48 (t, 3H), 1.02 (d, 6H).
73	δ 8.62 (dd, 1H), 7. 92 (br s, 1H, NH), 7.66 (m, 1H), 7.24 (m, 1H), 6.48 (s, 1H), 4.56 (q, 4H), 4.18 (q, 2H), 3.00 (m, 1H), 1.31 (t, 3H), 1.28 (t, 3H), 1.24 (d, 6H).
74	δ 8.52 (dd, 1H), 7. 80 (br s, 1H, NH), 7.62 (m, 1H), 7.28 (m, 1H), 6.48 (s, 1H,), 4.56 (q, 4H), 4.20 (q, 2H), 3.00 (m, 1H), 1.31 (t, 3H), 1.28 (t, 3H), 1.24 (d, 6H).
75	δ 8.66 (d, 1H), 7.26 (s, 1H), 6.78 (d, 1H), 6.47 (s, 1H), 4.57 (q, 2H), 3.90 (s, 3H), 3.89 (s, 3H), 1.44 (t, 3H), 1.33 (s, 9H).
76	δ 8.57 (d, 1H), 7.60 (s, 1H), 6.78 (d, 1H), 6.47 (s, 1H), 4.56 (q, 2H), 4.36 (q, 2H), 3.89 (s, 3H), 1.44 (t, 3H), 1.38 (t, 3H), 1.33 (s, 9H).
77	δ 8.55 (d, 1H), 7.57 (s, 1H), 6.78 (d, 1H), 6.47 (s, 1H), 5.22 (septet, 1H), 4.56 (q, 2H), 4.36 (q, 2H), 3.89 (s, 3H), 1.47 (t, 3H), 1.34 (d, 6H), 1.33 (s, 9H).
78	δ 8.00 (m, 4H), 7.45 (t, 1H), 6.61 (s, 1H), 5.86 (d, 1H), 4.92 (d, 1H), 4.40 (q, 2H), 1.36 (t, 3H), 1.28 (s, 9H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
79	δ 8.00 (s, 1H), 8.00 (dd, 1H), 7.90 (d, 1H), 7.42 (t, 1H), 6.54 (s, 1H), 6.40 (br s, 4.92 (m, 4H), 4.40 (q, 2H), 1.36 (t, 3H), 1.28 (s, 9H).
81	(DMSO-d_6) δ 1.29 (s, 9H), 1.3 (t, 3H), 3.88 (s, 3H), 4.4 (q, 2H), 7.0 (s, 1H), 7.5 (t, 1H), 7.7 (d, 1H), 8.0 (d, 1H), 8.4 (s, 1H), 10.3 (br s, 1H).
83	δ 8.04 (d, 1H), 7.80 (d, 1H), 7.42 (t, 1H), 6.52 (s, 1H), 4.73 (q, 2H), 4.58 (m, 2H), 1.42 (t, 3H), 1.38 (s, 9H).
84	δ 8.34 (s, 1H), 8.04 (d, 1H), 7.82 (d, 1H), 7.42 (t, 1H), 6.62 (s, 1H), 4.90 (d, 2H), 4.62 (q, 2H), 2.52 (t, 1H), 1.42 (t, 3H), 1.38 (s, 9H).
85	δ 8.24 (s, 1H), 8.06 (d, 1H), 7.82 (dd, 1H), 7.42 (t, 1H), 6.58 (s, 1H), 6.00 (m, 1H), 5.32 (m, 2H), 4.80 (d, 2H), 4.60 (q, 2H), 2.52 (t, 1H), 1.42 (t, 3H), 1.38 (s, 9H).
86	δ 8.24 (s, 1H), 8.06 (d, 1H), 7.82 (dd, 1H), 7.42 (t, 1H), 6.58 (s, 1H), 4.60 (d, 2H), 4.32 (t, 2H), 1.76 (m, 2H), 1.42 (t, 3H), 1.38 (s, 9H).
87	δ 7.90 (d, 1H), 7.72 (d, 2H), 7.55 (s, 1H), 7.30 (t, 1H), 6.50 (s, 1H), 4.56 (q, 2H), 3.91 (s, 3H), 2.52 (s, 3H), 1.44 (t, 3H), 1.34 (s, 9H).
88	δ 7.92 (d, 1H), 7.71 (d, 2H), 7.52 (s, 1H), 7.30 (t, 1H), 6.47 (s, 1H), 4.57 (q, 2H), 4.37 (q, 2H), 2.52 (s, 3H), 1.42 (t, 3H), 1.40 (t, 3H), 1.34 (s, 9H).
89	δ 8.00 (m, 2H), 7. 70 (br s, 1H, NH), 7.18 (t, 1H), 6.48 (s, 1H,), 4.56 (q, 4H), 4.42 (q, 2H),1.31 (m, 6H), 1.24 (s, 9H).
90	δ 7.93 (d, 1H), 7.73 (d, 1H), 7.53 (s, 1H), 7.30 (t, 1H), 6.47 (s, 1H), 4.57 (q, 2H), 4.27 (t, 2H), 2.53 (s, 3H), 1.80 (m, 2H), 1.44 (t, 2H), 1.35 (s, 9H), 1.04 (t, 3H).
91	δ 7.95 (d, 1H), 7.75 (d, 1H), 7.75 (s, 1H), 7.32 (t, 1H), 6.48 (s, 1H), 4.80 (m, 1H), 4.65~4.50 (m, 5H), 4.59 (q, 2H), 2.53 (s, 3H), 1.45 (t, 3H), 1.35 (s, 9H).
92	δ 7.90 (d, 1H), 7.68 (d, 1H), 7.52 (s, 1H), 7.30 (t, 1H), 6.47 (s, 1H), 5.23 (septet, 1H), 4.57 (q, 2H), 2.52 (s, 3H), 1.42 (t, 2H), 1.37 (d, 6H), 1.35 (s, 9H).
93	δ 7.92 (d, 1H), 7.73 (d, 1H), 7.54 (s, 1H), 7.31 (t, 1H), 4.57 (q, 2H), 4.15 (d, 2H), 2.53 (s, 3H), 1.44 (t, 2H), 1.35 (s, 9H), 1.29 (m, 1H), 0.64 (m, 2H), 0.36 (m, 2H).
94	δ 7.93 (d, 1H), 7.75 (d, 1H), 7.53 (s, 1H), 7.31 (t, 1H), 6.47 (s, 1H), 6.05 (dd of t, 1H), 5.42 (d, 1H), 5.25 (d, 1H), 4.82 (m, 2H), 4.57 (q, 2H), 2.53 (s, 3H), 1.44 (t, 2H), 1.35 (s, 9H).
95	δ 7.86 (d, 1H), 7.78 (d, 1H), 7.63 (s, 1H), 6.97 (d, 1H), 6.45 (s, 1H), 4.56 (q, 2H), 4.36 (q, 2H), 4.11 (q, 2H), 1.40 (m, 9H), 1.32 (s, 9H).
96	δ 7.86 (dd, 1H), 7.59 (s, 1H), 6.97 (d, 1H), 6.45 (s, 1H), 4.56 (q, 2H), 4.36 (q, 2H), 3.91 (s, 3H), 1.44 (t, 3H), 1.39 (t, 3H), 1.33 (s, 9H).
97	δ 8.60 (d, 1H), 8.43 (s, 1H), 7.62 (d, 1H), 7.20 (t, 1H), 6.44 (s, 1H), 4.60 (q, 2H), 4.42 (q, 2H), 3.94 (s, 3H), 1.46 (t, 3H), 1.42 (t, 3H), 1.34 (s, 9H).
98	δ 8.04 (d, 1H), 7. 94 (br s, 1H, NH), 7.80 (m, 2H), 7.40 (t, 1H), 6.48 (s, 1H), 4.58 (q, 4H), 1.61 (s, 9H), 1.44 (t, 3H), 1.33 (s, 9H).
99	δ 7.92 (s, 1H), 7.80 (d, 1H), 7.65 (s, 1H), 7.24 (d, 1H), 6.47 (s, 1H), 4.56 (q, 2H), 4.37 (q, 2H), 2.57 (s, 3H), 1.44 (t, 3H), 1.40 (t, 3H), 1.33 (s, 9H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
100	δ 7.85 (d, 1H), 7.83 (s, 1H), 7.64 (s, 1H), 7.24 (d, 1H), 6.47 (s, 1H), 5.25 (septet, 1H), 4.56 (q, 2H), 2.57 (s, 3H), 1.44 (t, 3H), 1.38 (d, 6H), 1.33 (s, 9H).
101	δ 8.30 (s, 1H), 7.87 (d, 1H), 7.77 (s, 1H), 6.92 (d, 1H), 6.58 (s, 1H), 5.21 (septet, 1H), 4.56 (q, 2H), 3.84 (s, 3H), 1.42 (t, 3H), 1.32 (d, 6H), 1.28 (s, 9H).
107	(DMSO-d_6) δ 1.0 (s, 9H), 2.0 (s, 3H), 3.38 (s, 3H), 3.8 (s, 3H), 5.4 (s, 1H), 7.2 (d, 1H), 7.3 (t, 1H), 7.4 (s, 1H), 7.5 (d, 1H), 11.3 (s, 1H).
110	δ 8.7 (br s, 1H), 7.83–7.88 (m, 2H), 7.36–7.38 (m, 2H), 6.6 (s, 1H), 4.7 (m, 1H), 2.3 (s, 1H), 1.55 (s, 3H), 1.53 (s, 3H), 1.4 (s, 9H).
111	δ 7.96 (d, 1H), 7.55 (d, 1H), 7.47 (s, 1H), 7.34 (t, 1H), 6.45 (s, 1H), 4.16 (s, 1H), 3.04 (m, 4H), 3.18 (s, 2H), 1.34 (s, 9H).
114	δ 11.20 (s, 1H), 10.30 (s, 1H), 8.14 (s, 1H), 7. 94 (m, 1H), 7.74 (m, 1H), 7.40 (m, 2H), 7.11 (s, 1H), 5.68 (d, 1H), 4.90 (d, 1H), 2.15 (s, 3H), 1.32 (s, 9H).
115	δ 8.00 (m, 2H), 7. 64 (s, 1H), 7.40 (m, 2H), 6.54 (s, 1H), 4.91 (m, 4H), 2.28 (s, 3H), 1.32 (s, 9H)
116	δ 7.88 (d, 1H), 7.65 (d, 1H), 7.47 (s, 1H), 7.27 (t, 1H), 6.48 (s, 1H), 4.16 (s, 1H), 2.81 (t, 2H), 2.71 (t, 2H), 1.90 (m, 2H), 3.18 (s, 2H), 1.34 (s, 9H).
117	(DMSO-d_6) δ 11.2 (s, 1H), 10.2 (br s, 1H), 8.0 (s, 1H), 7.7 (d, 1H), 7.35–7.38 (m, 3H), 7.0 (s, 1H), 6.0 (m, 1H), 5.1 (d, 2H), 4.9 (d, 1H), 2.51 (s, 3H), 1.29 (s, 9H).
124	δ 8.04 (m, 2H), 7. 60 (dd, 1H), 7.46 (t, 2H), 6.64 (s, 1H), 4.16 (s, 3H), 3.40 (m, 1H), 1.32 (s, 9H), 1.13 (d, 6H).
125	δ 8.36 (s, 1H), 8.16 (dd, 1H), 7. 94 (s, 1H), 7.60 (m, 1H), 7.52 (t, 1H), 6.54 (s, 1H) 4.15 (s, 3H), 3.00 (m, 2H), 1.35 (m, 4H), 1.28 (s, 9H), 0.90 (t, 3H).
127	δ 8.14 (s, 1H), 7. 94 (m, 3H), 7.64 (m, 1H), 7.44 (t, 1H), 6.61 (s, 1H), 5.88 (d, 1H), 4.93 (d, 1H), 2.65 (s, 3H), 1.32 (s, 9H).
128	δ 8.10 (m, 1H), 8.00 (m, 1H), 7. 90 (br s, 1H), 7.60 (dd, 1H), 7.42 (t, 1H), 6.56 (s, 1H), 4.71 (m, 4H), 2.62 (s, 3H), 1.32 (s, 9H).
129	(DMSO-d_6) δ 10.3 (br s, 1H), 8.0 (d, 1H), 7.7 (d, 1H), 7.5 (t, 1H), 7.0 (s, 1H), 6.0 (m, 1H), 5.1 (d, 2H), 4.9 (d, 1H), 2.58 (s, 3H), 1.29 (s, 9H).
130	δ 7.82 (s, 1H), 7.80 (dd, 1H), 7.62 (s, 1H, NH), 7.40 (d, 2H), 6.48 (s, 1H), 4.58 (q, 2H), 1.42 (t, 3H), 1.38 (s, 9H).
131	δ 8.42 (s, 1H, NH), 8.20 (dd, 1H), 8.00 (s, 1H, NH), 7.74 (d, 1H), 7.40 (t, 1H), 6.68 (s, 1H), 4.58 (q, 2H), 2.92 (s, 3H), 1.42 (t, 3H), 1.38 (s, 9H).
132	δ 8.40 (s, 1H, NH), 8.20 (dd, 1H), 7.80 (s, 1H, NH), 7.74 (d, 1H), 7.40 (t, 1H), 6.68 (s, 1H), 4.40 (m, 4H), 1.38 (s, 9H).
133	δ 8.42 (s, 1H, NH), 8.20 (dd, 1H), 8.00 (s, 1H, NH), 7.74 (d, 1H), 7.40 (t, 1H), 6.68 (s, 1H), 4.58 (q, 2H), 3.22 (s, 3H), 1.42 (t, 3H), 1.38 (s, 9H).
134	δ 8.22 (s, 1H, NH), 8.20 (dd, 1H), 8.00 (s, 1H, NH), 7.74 (d, 1H), 7.40 (t, 1H), 6.68 (s, 1H), 4.58 (q, 2H), 1.42 (t, 3H), 1.38 (s, 9H).
135	δ 7.86 (s, 1H), 7.80 (dd, 1H), 7.60 (s, 1H, NH), 7.40 (d, 2H), 6.48 (s, 1H), 4.58 (q, 2H), 1.42 (t, 3H), 1.38 (s, 9H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
136	δ 7.62 (s, 1H, NH), 7.36 (m, 2H), 7.08 (dd, 1H,), 6.86 (dd, 1H), 6.60 (dd, 1H), 6.42 (s, 1H), 4.58 (q, 2H), 4.00 (q, 2H), 1.42 (m, 6H), 1.31 (s, 9H).
137	δ 7.60 (s, 1H, NH), 7.364(m, 2H), 7.08 (dd, 1H,), 6.86 (dd, 1H), 6.60 (dd, 1H), 6.40 (s, 1H), 4.58 (q, 2H), 4.00 (t, 2H), 1.90 (m, 2H), 1.52 (m, 2H), 1.42 (t, 3H), 1.31 (s, 9H), 0.97 (s, 3H).
138	δ 7.62 (s, 1H, NH), 7.36 (m, 1H), 7.28 (m, 1H,), 7.00 (m, 1H), 6.60 (dd, 1H), 6.40 (s, 1H), 4.58 (q, 2H), 4.24 (t, 2H), 2.20 (m, 2H), 1.52 (m, 2H), 1.42 (t, 3H), 1.31 (s, 9H).
139	δ 8.01 (s, 1H), 7.80 (m, 2H), 7.22 (m, 2H), 7.20 (t, 1H), 6.52 (s, 1H), 4.56 (q, 2H), 1.43 (t, 3H), 1.33 (s, 9H).
141	δ 7.92 (s, 1H), 7.80 (d, 1H), 7.65 (s, 1H), 7.24 (d, 1H), 6.47 (s, 1H), 4.56 (q, 2H), 4.37 (q, 2H), 2.57 (s, 3H), 1.44 (t, 3H), 1.40 (t, 3H), 1.33 (s, 9H).
142	δ 8.60 (s, 1H, NH), 8.46 (s, 1H), 8.40 (d, 1H), 7.20 (d, 1H), 6.60 (s 1H), 5.90 (m, 1H), 5.80 (m, 1H), 4.54 (q, 2H), 4.40 (m, 2H), 4.20 (m, 2H), 1.42 (t, 3H), 1.31 (s, 9H).
144	δ 8.42 (d, 1H), 7.92 (m, 2H), 7.80 (s, 1H, NH), 6.60 (s, 1H), 4.60 (q, 2H), 3.40 (q, 2H), 1.40 (t, 3H), 1.31 (s, 9H).
145	δ 8.50 (s, 1H, NH), 8.22 (d, 1H), 7.80 (t, 1H), 7.30 (d, 1H), 6.60 (s, 1H), 4.60 (q, 2H), 3.56 (q, 2H), 3.32 (q, 2H), 1.43 (s, 9H), 1.30 (t, 3H), 1.15 (t, 3H).
146	δ 8.39 (d, 1H), 8.20 (s, 1H, NH), 7.92 (d, 1H), 7.84 (t, 1H), 7.80 (s, 1H), 6.60 (s, 1H), 4.60 (q, 2H), 2.96 (m, 1H), 1.40 (t, 3H), 1.31 (s, 9H), 0.88 (m, 2H), 0.68 (m, 2H).
147	δ 8.42 (m, 2H), 7.92 (m, 3H, NH), 6.60 (s, 1H), 4.60 (q, 2H), 4.20 (m, 2H), 2.22 (m, 1H), 1.46 (t, 3H), 1.31 (s, 9H).
148	δ 8.62 (s, 1H), 8.32 (s, 1H), 7.42 (s, 1H), 6.60 (s, 1H), 4.60 (q, 2H), 3.96 (s, 3H), 2.52 (s, 3H), 1.46 (t, 3H), 1.31 (s, 9H).
149	δ 8.52 (s, 1H), 8.32 (s, 1H), 7.42 (s, 1H), 6.60 (s, 1H), 6.42 (t, 1H, NH), 4.60 (q, 2H), 3.40 (q, 2H), 2.52 (s, 3H), 1.46 (t, 3H), 1.31 (s, 9H).
150	δ 8.22 (s, 1H), 8.18 (s, 1H), 7.82 (s, 1H), 7.64 (t, 1H), 6.57 (s, 1H), 4.60 (q, 2H), 3.40 (q, 2H), 2.52 (s, 3H), 1.46 (t, 3H), 1.31 (s, 9H).
152	δ 8.60 (s, 1H, NH), 8.38 (d, 2H), 7.60 (d, 1H), 6.58 (s, 1H), 6.40 (t, 1H, NH), 4.58 (q, 2H), 3.60 (q, 2H), 1.45 (t, 3H), 1.31 (s, 9H), 1.28 (t, 3H).
153	δ 8.60 (s, 1H, NH), 8.38 (d, 2H), 7.04 (d, 1H), 6.58 (s, 1H), 4.58 (q,. 2H), 3.60 (q, 2H), 3.28 (q, 2H), 1.40 (t, 3H), 1.31 (s, 9H), 1.28 (t, 3H).
154	δ 8.60 (s, 1H, NH), 8.40 (d, 2H), 7.60 (d, 1H), 6.58 (s, 1H), 6.40 (t, 1H, NH), 4.58 (q, 2H), 3.40 (t, 2H), 1.96 (m, 1H), 1.31 (s, 9H), 1.28 (t, 3H), 1.4 (d, 6H).
155	δ 8.60 (s, 1H, NH), 8.40 (d, 2H), 7.60 (d, 1H), 6.58 (s, 1H), 6.50 (t, 1H, NH), 4.58 (q, 2H), 3.36 (t, 2H), 1.90 (m, 1H), 1.31 (s, 9H), 1.30 (t, 3H), 1.28 (t, 3H), 0.62 (m, 2H), 0.36 (m, 2H).
157	δ 8.80 (s, 1H), 8.42 (d, 1H), 7.64 (d, 1H), 6.58 (s, 1H), 4.58 (q, 2H), 4.26 (q, 2H), 1.45 (m, 6H), 1.21 (s, 9H).
158	δ 8.42 (m, 2H), 7.92 (m, 3H, NH & aromatic), 6.60 (s, 1H), 4.60 (q, 2H), 4.20 (m, 2H), 3.12 (s, 3H), 2.22 (m, 1H), 1.46 (t, 3H), 1.31 (s, 9H).

Cmpd No.	^1H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
159	δ 8.68 (s, 1H, NH), 8.40 (d, 2H), 7.04 (d, 1H), 6.61 (s, 1H), 5.86 (m, 1H), 5.22 (m, 2H), 4.58 (q, 2H), 4.20 (d, 1H), 3.80 (d, 1H), 3.08 (s, 3H), 1.42 (t, 3H), 1.31 (s, 9H).
160	δ 8.80 (s, 1H, NH), 8.40 (d, 1H), 7.14 (dd, 1H), 6.61 (s, 1H), 4.58 (q, 2H), 4.40 (d, 1H), 4.00 (d, 1H), 3.17 & 3.06 (2xs, 3H), 2.20 (m, 1H), 1.42 (t, 3H), 1.31 (s, 9H).
161	δ 8.68 (s, 1H, NH), 8.52 (s, 1H), 8.40 (d, 1H), 7.46 (d, 1H), 6.80 (t, 1H, NH), 6.61 (s, 1H), 4.58 (q, 2H), 3.60 (m, 4H), 3.40 (s, 1H), 1.48 (t, 3H), 1.31 (s, 9H).
163	δ 8.46 (m, 2H, NH and 1 aromatic), 7.80 (m, 1H), 7.32 (dd, 1H), 6.55 (s, 1H), 5.82 (m, 1H), 5.34 (m, 2H), 4.60 (q, 2H), 4.20 (d, 1H), 3.92 (d, 1H), 3.09 (2 s, 3H), 1.43 (t, 3H), 1.30 (s, 9H).
165	δ 8.40 (d, 1H), 8.36 (br s, 1H), 6.58 (s, 1H), 6.48 (d, 1H), 4.60 (q, 2H), 3.99 (s, 3H), 1.45 (q, 3H), 1.30 (s, 9H).
166	δ 8.20 (br s, 1H), 6.51 (s, 1H), 5.80 (s, 1H), 4.60 (q, 2H), 3.96 (s, 6H), 1.45 (q, 3H), 1.30 (s, 9H).
167	δ 8.16 (br s, 1H), 6.56 (s, 1H), 6.02 (s, 1H), 5.00 (br s, 1H), 4.54 (q, 2H), 3.90 (s, 3H), 1.30 (s, 9H), 1.26 (t, 3H).
169	δ 8.74 (br s, 1H), 7.87 (s, 1H), 7.82 (d, 1H), 7.82 (d, 1H), 7.6 (m, 1H), 7.3 (t, 1H), 7.1 (d, 1H) 3.5 (m, 2H), 3.3 (m, 2H), 1.66 (s, 9H), 1.2 (m, 3H), 1.1 (m, 3H).
170	δ 8.83 (br s, 1H), 8.14 (s, 1H), 7.84–7.88 (m, 2H), 7.56 (d, 1H), 7.42 (t, 1H), 6.28 (br s, 1H), 3.4 (q, 2H), 1.6 (s, 9H), 1.27 (t, 3H).
171	δ 8.75 (br s, 1H), 7.86–7.89 (m, 3H), 7.36–7.39 (m, 2H), 2.3 (s, 3H), 1.66 (s, 9H).
172	δ 8.0 (s, 1H), 7.99 (s, 1H), 7.92 (br s, 1H), 7.7 (d, 1H), 7.5 (d, 1H), 7.4 (t, 1H), 6.2 (m, 1H), 4.2 (q, 2H), 3.5 (m, 2H), 1.5 (t, 3H), 1.2 (t, 3H).
183	δ 7.99 (s, 1H), 7.96 (s, 1H), 7.78 (d, 1H), 7.7 (br s, 1H), 7.47 (d, 1H) 7.4 (t, 1H), 6.2 (br s, 1H), 3.4 (q, 2H), 2.56 (s, 3H), 1.59 (s, 9H), 1.2 (t, 3H).
184	δ 8.0 (s, 1H), 7.88 (br s, 1H), 7.6 (d, 1H), 7.4 (s, 1H), 7.3 (t, 1H), 7.0 (d, 1H), 3.5 (m, 2H), 3.3 (m, 2H), 2.55 (s, 3H), 1.6 (s, 9H), 1.3 (m, 3H), 1.1 (m, 3H).
185	δ 8.0 (s, 1H), 7.9 (br s, 1H), 7.6 (d, 1H), 7.4 (s, 1H), 7.3 (t, 1H), 7.0 (d, 1H), 3.5 (m, 2H), 3.3 (m, 2H), 2.89 (t, 2H), 1.7 (q, 2H), 1.6 (s, 9H), 1.3 (m, 3H), 1.1 (m, 3H), 0.99 (t, 3H).
186	δ 8.0 (dd, 1H), 7.98 (s, 1H), 7.94 (s, 1H), 7.79 (dd, 1H), 7.55 (br s, 1H), 7.4 (t, 1H), 4.38 (q, 2H), 2.96 (q, 2H), 1.59 (s, 9H), 1.4 (t, 3H), 1.33 (t, 3H).
187	δ 8.02 (d, 1H), 8.0 (s, 1H), 7.96 (s, 1H), 7.7 (d, 1H), 7.6 (br s, 1H), 7.4 (t, 1H), 2.9 (q, 2H), 2.62 (s, 3H), 1.6 (s, 9H), 1.34 (t, 3H).
188	(DMSO-d_6) δ 11.2 (s, 1H), 9.6 (br s, 1H), 8.5 (s, 1H), 8.0 (d, 1H), 7.0–7.7 (m, 1H), 7.29–7.36 (m, 2H), 2.8 (q, 2H), 2.15 (s, 3H), 1.54 (s, 9H), 1.16 (t, 3H).
189	δ 7.9 (s, 1H), 7.34–7.36 (m, 2H), 7.2 (t, 1H), 7.0 (dd, 1H), 6.6 (dd, 1H), 4.5 (m, 1H), 2.55 (s, 3H), 1.59 (s, 9H), 1.35 (s, 3H), 1.33 (s, 3H).
190	δ 7.93 (s, 1H), 7.36–7.37 (m, 2H), 7.22 (t, 1H), 7.0 (dd, 1H), 6.6 (dd, 1H), 4.0 (q, 2H), 2.56 (s, 3H), 1.59 (s, 9H), 1.41 (t, 3H).
191	δ 8.2 (s, 1H), 7.8 (br s, 1H), 7.59–7.62 (m, 2H), 7.39 (t, 1H), 7.15 (d, 1H), 3.5 (m, 2H), 3.3 (m, 2H), 1.6 (s, 9H), 1.2 (m, 3H), 1.1 (m, 3H).

Cmpd No.	^1H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
192	δ 8.18 (s, 1H), 8.0 (s, 1H), 7.8 (br s, 1H), 7.7 (d, 1H), 7.57 (d, 1H), 7.4 (t, 1H), 6.2 (br s, 1H), 3.5 (m, 1H), 1.6 (s, 9H), 1.26 (t, 3H).
193	δ 8.7 (dd, 1H), 7.94 (s, 1H), 7.65–7.7 (m, 2H), 7.15–7.22 (m, 1H), 6.2 (br s, 1H), 3.4 (m, 2H), 2.9 (q, 2H), 1.6 (s, 9H), 1.35 (t, 3H), 1.25 (t, 3H).
194	δ 8.79 (dd, 1H), 7.93 (s, 1H), 7.66–7.7 (m, 1H), 7.16–7.23 (m, 1H), 6.3 (br s, 1H), 3.0 (d, 3H), 1.6 (s, 9H), 1.35 (t, 3H).
195	δ 11.20 (s, 1H), 8.00 (s, 1H), 7.84 (d, 1H), 7.60 (s, 1H, NH), 7.46 (d, 1H), 7.40 (t, 1H), 2.73 (s, 3H), 2.16 (s, 3H), 1.45 (s, 9H).
196	δ 8.00 (s, 1H), 7.84 (d, 1H), 7.60 (s, 1H, NH), 7.46 (d, 1H), 7.40 (t, 1H), 2.73 (s, 3H), 2.24 (s, 3H), 1.45 (s, 9H).
197	δ 7.97 (s, 1H), 7.74 (d, 1H), 7.62 (s, 1H, NH), 7.46 (d, 1H), 7.40 (t, 1H), 3.40 (s, 3H), 2.73 (s, 3H), 1.45 (s, 9H).
198	δ 8.00 (s, 1H), 7.84 (d, 1H), 7.60 (s, 1H, NH), 7.46 (d, 1H), 7.40 (t, 1H), 6.26 (br s, 1H, NH), 3.50 (q, 2H), 2.73 (s, 3H), 1.45 (s, 9H), 1.20 (t, 3H).
199	δ 8.00 (s, 1H, NH), 7.64 (dd, 1H), 7.52 (d, 1H), 7.32 (t, 1H), 7.02 (dd, 1H), 3.50 (m, 2H), 3.28 (m, 2H), 2.71 (s, 3H), 1.45 (s, 9H), 1.22 (m, 6H).
200	δ 8.00 (s, 1H), 7.84 (d, 1H), 7.60 (m, 2H, NH & aromatic), 7.40 (t, 1H), 6.56 (br s, 1H, NH), 4.69 (t, 1H), 4.53 (t, 1H), 3.80 (m, 2H), 2.73 (s, 3H), 1.45 (s, 9H).
201	δ 8.00 (s, 1H), 7.84 (d, 1H), 7.60 (d, 1H, aromatic), 7.46 (s, 1H, NH), 7.36 (t, 1H), 6.46 (br s, 1H, NH), 4.18 (m, 2H), 2.73 (s, 3H), 1.45 (s, 9H).
202	δ 8.00 (s, 1H), 7.84 (d, 1H), 7.80 (s, 1H, NH), 7.60 (d, 1H), 7.36 (t, 1H), 6.46 (br s, 1H, NH), 5.88 m, 1H), 5.24 (m, 2H), 4.06 (t, 2H), 2.73 (s, 3H), 1.45 (s, 9H).
203	δ 8.00 (s, 1H), 7.84 (d, 1H), 7.80 (s, 1H, NH), 7.60 (d, 1H), 7.36 (t, 1H), 6.46 (br s, 1H, NH), 4.26 (m, 2H), 2.73 (s, 3H), 1.45 (s, 9H).
204	δ 8.00 (s, 1H), 7.84 (d, 1H), 7.60 (s, 1H, NH), 7.46 (d, 1H), 7.40 (t, 1H), 4.20 (q, 2H), 3.50 (q, 2H), 1.45 (s, 9H), 1.20 (m, 6H).
205	δ 8.20 (s, 1H, NH), 7.64 (dd, 1H), 7.52 (d, 1H), 7.32 (t, 1H), 7.02 (dd, 1H), 3.50 (m, 2H), 3.28 (m, 2H), 3.18 (q, 2H), 1.42 (s, 9H), 1.22 (m, 9H).
206	δ 8.00 (s, 1H), 7.84 (d, 1H), 7.60 (s, 1H, NH), 7.56 (d, 1H), 7.40 (t, 1H), 6.56 (br s, 1H, NH), 4.08 (m, 2H), 3.20 (q, 2H), 1.45 (s, 9H), 1.20 (t, 3H).
207	δ 8.00 (s, 1H), 7.86 (s, 1H, NH), 7.80 (dd, 1H), 7.52 (d, 1H), 7.42 (t, 1H), 6.40 (t, 1H, NH), 5.92 (m, 1H), 5. 24 (m, 2H), 4.04 (m, 2H), 3.18 (q, 2H), 1.42 (s, 9H), 1.22 (t, 3H).
209	δ 8.00 (s, 1H,), 7.80 (dd, 1H), 7.66 (s, 1H, NH), 7.62 (d, 1H,), 7.42 (t, 1H), 6.60 (t, 1H, NH), 4.64 (m, 1H), 4.52 (m, 1H), 3.80 (m, 2H), 3.04 (q, 2H), 1.42 (s, 9H), 1.22 (t, 3H).
210	δ 8.00 (s, 1H,), 7.80 (dd, 1H), 7.66 (s, 1H, NH), 7.62 (d, 1H,), 7.42 (t, 1H), 6.20 (t, 1H, NH), 3.50 (q, 2H), 3.04 (q, 2H), 1.42 (s, 9H), 1.22 (t, 3H).
211	δ 8.00 (s, 1H,), 7.90 (s, 1H, NH), 7.80 (dd, 1H), 7.62 (d, 1H,), 7.42 (t, 1H), 6.40 (t, 1H, NH), 3.20 (m, 2H), 3.04 (q, 2H), 1.80 (m, 1H), 1.42 (s, 9H), 1.22 (t, 3H).

Cmpd No.	^1H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
212	δ 8.00 (s, 1H,), 7.90 (s, 1H, NH), 7.80 (dd, 1H), 7.62 (d, 1H,), 7.40 (t, 1H), 6.40 (t, 1H, NH), 3.20 (m, 2H), 3.04 (q, 2H), 1.35 (s, 9H), 1.22 (t, 3H), 1.00 (m, 1H), 0.58 (m, 2H), 0.30 (m, 2H).
213	δ 8.40 (d, 1H), 8.04 (s, 1H, NH), 8.00 (d, 1H), 7.82 (t, 1H), 7.60 (t 1H, NH), 3.54 (q, 2H), 3.06 (q, 2H), 1.42 (s, 9H), 1.32 (m, 6H).
214	δ 8.34 (d, 1H), 8.04 (s. 1H, NH), 7.82 (t, 1H), 7.22 (d, 1H), 3.54 (q, 2H), 3.36 (q, 2H), 3.06 (q, 2H), 1.42 (s, 9H), 1.32 (m, 9H).
215	δ 8.40 (d, 1H), 8.04 (s, 1H, NH), 8.00 (m, 2H), 3.34 (q, 2H), 3.06 (q, 2H), 1.42 (s, 9H), 1.32 (t, 3H), 1.00 (m, 1H), 0.56 (m, 2H), 0.36 (m, 2H).
216	δ 8.40 (d, 1H), 8.04 (s, 1H, NH), 7.96 (d, 1H), 7.84 (t, 1H), 7.60 (br s, 1H, NH), 3.30 (t, 2H), 3.06 (q, 2H), 1.90 9m, 1H), 1.42 (s, 9H), 1.32 (t, 3H), 1.00 (d, 6H).
217	δ 8.40 (d, 1H), 8.04 (s, 1H, NH), 7.96 (m, 3H, NH & aromatic), 4.22 (m, 2H), 3.06 (q, 2H), 2.22 (m, 1H), 1.42 (s, 9H), 1.32 (t, 3H).
218	δ 8.8 (br s, 1H), 7.75 (d, 1H), 7.70 (s, 1H), 7.59 (s, 1H), 7.38 (t, 1H), 7.11 (d, 1H), 3.5 (m, 2H), 3.3 (m, 2H), 1.6 (s, 9H), 1.3 (m, 3H), 1.1 (m, 3H).
219	δ 8.77 (br s, 1H), 8.18 (s, 1H), 7.81 (d, 1H), 7.6 (s, 1H), 7.56 (d, 1H), 7.42 (t, 1H), 6.27 (br s, 1H), 3.5 (m, 2H), 1.6 (s, 9H), 1.26 (t, 3H).
220	δ 8.74 (br s, 1H), 7.78 (d, 1H), 7.70 (s, 1H), 7.6 (s, 1H), 7.6 (s, 1H), 7.37 (t, 1H), 7.1 (d, 1H), 3.5 (m, 2H), 3.3 (m, 2H), 1.6 (s, 9H), 1.3 (m, 3H), 1.1 (m, 3H).
225	δ 8.42 (dd, 1H), 7.74 (s, 1H), 7.19 (m, 2H), 3.12 (q, 3H), 3.03 (s, 3H), 3.00 (s, 3H), 1.37 (s, 9H), 1.30 (t, 6H).
226	δ 8.70 (dd, 1H), 7.74 (s, 1H), 7.70 (m, 1H,), 7.20 (t, 1H), 3.42 q, 2H), 3.08 (q, 2H), 1.28 (s, 9H), 1.26 (t, 3H), 1.20 (t, 3H).
227	δ 8.45 (s, 1H), 7.64 (dd, 1H), 7.58 (s, 1H), 7.36 (t, 1H), 7.08 (d, 1H), 3.20 (m, 2H), 2.99 (s, 3H), 2.70 (s, 3H), 1.44 (s, 9H), 1.05 (t, 3H).
228	δ 8.34 (s, 1H), 7.74 (d, 1H), 7.60 (s, 1H), 7.34 (t, 1H), 7.16 (s, 1H), 3.12 (q, 2H), 3.06 (s, 3H), 3.00 (s, 3H), 1.42 (s, 9H), 1.25 (t, 3H).
229	δ 8.20 (s, 1H,), 7.68 (dd, 1H), 7.60 (s, 1H,), 7.32 (t, 1H), 7.02 (dd, 1H), 3.32 (m, 2H), 3.28 (m, 2H), 3.10 (s, 3H), 1.45 (s, 9H), 1.22 (m, 6H).
230	δ 8.40 (d, 1H), 7.80 (d, 1H), 7.22 (dd, 1H), 3.50 (m, 4H), 3.18 (q, 2H), 1.42 (s, 9H), 1.22 (m, 6H).
231	δ 8.40 (d, 1H), 7.74 (s, 1H), 7.18 (m, 2H), 3.28 (m, 2H), 3.08 (q, 2H), 3.02 (s, 3H), 1.45 (s, 9H), 1.32 (t, 3H), 1.26 (t, 3H).
237	δ 8.80 (dd, 1H), 7.72 (m, 1H,), 7.20 (m, 1H), 6.36 (s, 1H), 5.86 (m, 1H,), 5.22 (m, 2H), 4.10 (m, 2H), 3.08 (q, 2H), 1.35 (s, 9H), 1.32 (t, 3H).
238	δ 1.3 (t, 3H), 1.4 (t, 3H), 1.6 (s, 9H), 3.0 (q, 2H), 4.4 (q, 2H), 7.6 (d, 1H), 8.0 (s, 1H), 8.3 (d, 1H), 8.6 (br s, 1H, NH), 8.8 (s, 1H).
242	δ 8.6 (dd, 1H), 7.95 (br s, 1H,NH), 7.3 (m, 2H), 7.2 (m, 1H), 6.48 (s, 1H), 4.6 (m, 2H), 3.63 (m, 2H), 3.49 (m, 2H), 1.95 (m, 4H), 1.44 (t, 3H), 1.34 (s, 9H).
243	δ 8.5 (dd, 1H), 7.9 (br s, 1H, NH), 7.18 (m, 2H), 6.48 (s, 1H), 4.57 (m, 2H), 3.7 (m, 8H), 1.44 (t, 3H), 1.33 (s, 9H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
244	δ 8.75 (dd, 1H), 7.8 (br s, 1H, NH), 7.45 (m, 1H), 7.2 (m, 1H), 6.49 (s, 1H), 4.59 (m, 2H), 3.63 (s, 3H), 3.36 (s, 3H), 1.42 (t, 3H), 1.26 (s, 9H).
245	δ 8.35 (d, 1H), 8.33 (br s, 1H, NH), 7.8 (t, 3H), 7.43(d, 1H), 6.54 (s, 1H), 4.6 (q, 2H), 3.62 (m, 4H), 2.00 (m, 4H), 1.4 (t, 3H), 1.29 (s, 9H).
246	δ 8.4 (d, 1H), 8.37 (br s, 1H, NH), 7.8 (t, 1H), 7.4 (d, 1H), 6.55 (s, 1H), 4.6 (q, 2H), 3.66 (s, 3H), 3.4 (s, 3H), 1.5 (t, 3H), 1.31 (s, 9H).
247	δ 8.4 (d, 1H), 8.39 (br s, 1H, NH), 7.85 (t, 1H), 7.29 (d, 1H), 6.55 (s, 1H), 4.6 (q, 2H), 3.3–4.00 (m, 8H), 1.33 (t, 3H), 1.26 (s, 9H).
248	δ 8.88 (t, 1H), 7.65 (s, 1H), 6.98 (t, 1H), 6.48 (s, 1H), 5.22 (m, 1H), 4.57 (q, 2H), 1.46 (t, 2H), 1.40 (d, 6H), 1.33 (s, 9H).
249	δ 8.83 (t, 1H), 7.65 (s, 1H), 6.99 (t, 1H), 6.48 (s, 1H), 4.56 (q, 2H), 4.30 (t, 2H), 1.80 (m, 2H), 1.47 (t, 2H), 1.33 (s, 9H), 1.03 (t, 3H).
250	δ 8.83 (t, 1H), 7.64 (s, 1H), 6.98 (t, 1H), 6.45 (s, 1H), 4.58 (q, 2H), 4.40 (q, 2H), 1.45 (t, 3H), 1.41 (t, 2H), 1.33 (s, 9H).
251	δ 8.83 (m, 1H), 7.62 (s, 1H), 6.98 (t, 1H), 6.55 (br s, 1H), 6.45 (s, 1H), 4.56 (q, 2H), 3.03 (d, 3H), 1.43 (t, 3H), 1.33 (s, 9H).
252	δ 8.83 (m, 1H), 7.62 (s, 1H), 6.98 (t, 1H), 6.55 (br s, 1H), 6.49 (s, 1H), 4.56 (q, 2H), 3.52 (m, 2H), 1.43 (t, 3H), 1.33 (s, 9H), 1.25 (t, 3H).
253	δ 8.23 (m, 1H), 7.92 (s, 1H), 6.97 (t, 1H), 6.53 (s, 1H), 4.56 (q, 2H), 3.55 (q, 2H), 3.22 (q, 2H), 1.43 (t, 3H), 1.33 (s, 9H), 1.27 (t, 3H), 1.14 (t, 3H).
254	δ 8.23 (m, 1H), 8.02 (s, 1H), 6.97 (m, 1H), 6.53 (s, 1H), 4.54 (q, 2H), 3.50 and 3.35 (q, 2H, amide isomers), 3.09 and 2.93 (s, 3H, amide isomers), 1.43 (t, 3H), 1.33 (s, 9H), 1.25 and 1.16 (t, 3H, amide isomers).
256	δ 8.82 (s, 1H), 8.52 (d, 1H), 8.00 (m, 1H), 7.72 (s, 1H), 6.66 (s, 1H), 4.62 (q, 2H), 3.10 (s, 3H), 3.09 (s, 3H), 1.42 (t, 3H), 1.33 (s, 9H).
257	δ 8.78 (s, 1H), 8.42 (d, 1H), 8.10 (m, 1H), 7.82 (s, 1H), 7.72 (s, 1H), 6.66 (s, 1H), 4.62 (q, 2H), 3.82 (q, 2H), 1.42 (t, 3H), 1.33 (s, 9H), 1.30 (t, 3H).
258	δ 8.72 (s, 1H), 8.41 (s, 1H), 8.26 (s, 1H), 8.12 (s, 1H), 6.59 (s, 1H), 4.57 (q, 2H), 3.14 (s, 3H), 3.05 (s, 3H), 1.45 (t, 3H), 1.34 (s, 9H).
259	δ 8.90 (s, 1H), 8.78 (s, 1H), 8.50 (s, 1H), 8.04 (s, 1H), 6.56 (s, 1H), 6.20 (s, 1H), 4.58 (q, 2H), 3.52 (q, 2H), 1.48 (t, 3H), 1.32 (s, 9H), 1.26 (t, 3H).
260	δ 8.70 (s, 1H), 8.58 (s, 1H), 8.40 (s, 1H), 7.80 (s, 1H), 6.54 (s, 1H), 6.0 (m, 1H), 5.80 (m, 1H), 4.57 (q, 2H), 4.51 (m, 2H), 4.30 (m, 2H), 1.47 (t, 3H), 1.34 (s, 9H).
262	δ 10.50 (s, 1H), 9.00 (s, 1H,), 8.40 (s, 1H), 8.20 (s, 1H), 6.96 (s, 1H,), 5.92 (m, 2H), 5.30 (m, 4H), 4.32 (q, 2H), 4.12(m, 2H), 3.80 (m, 2H), 1.32 (t, 3H), 1.30 (s, 9H).
263	δ 8.70 (s, 1H,), 8.42 (s, 1H), 8.18 (m, 1H,), 8.08 (s, 1H), 6.58 (s, 1H), 4.57 (q, 2H), 3.60 (q, 2H), 3.10 (s, 3H), 1.46 (t, 3H), 1.34 (s, 9H), 1.26 (m, 3H).
264	δ 8.68 (s, 1H), 8.41 (s, 1H), 8.26 (s, 1H), 8.12 (s, 1H), 6.59 (s, 1H), 4.57 (q, 2H), 3.86 (s, 2H), 2.12 (m, 1H), 1.45 (t, 3H), 1.34 (s, 9H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
265	δ 8.78 (d, 1H,), 8.12 (d, 1H,), 6.47 (s, 1H), 4.42 (q, 2H), 3.82 (s, 3H), 3.76 (s, 3H), 1.36 (t, 3H), 1.29 (s, 9H).
266	δ 8.80 (d, 1H,), 8.08 (s, 1H), 8.02 (d, 1H,), 6.47 (s, 1H), 4.42 (q, 2H), 4.02 (q, 2H), 1.36 (m, 6H), 1.29 (s, 9H).
269	δ 9.3 (s, 1H), 8.70 (d, 1H), 8.65 (m, 1H), 7.15 (t, 1H), 6.20 (br s, 1H), 4.12 (m, 1H), 3.70 (t, 1H), 3.50 (m, 2H), 3.30 (dd, 1H), 3.15 (m, 1H), 2.95 (m, 1H), 2.80 (dd, 1H), 1.34–1.20 (m, 6H), 1.17 (s, 9H).
270	δ 8.37 (t, 1H), 7.90 (s, 1H), 6.93 (t, 1H), 6.52 (s, 1H), 4.55 (q, 2H), 3.12 (s, 3H), 2.97 (s, 3H), 1.43 (t, 3H), 1.33 (s, 9H).
271	δ 8.90 and 8.75 (d, 1H, amide isomers), 8.18 and 8.13 (s, 1H, amide isomers), 7.88 and 7.70 (m, 1H), 7.22 and 7.19 (t, 1H, amide isomers), 4.58 (q, 2H), 1.45 (t, 3H), 1.34 (s, 9H).
272	δ 7.82 (s, 1H), 7.60 (s, 1H), 7.45 (d, 1H), 7.36 (t, 1H), 7.00 (d, 1H), 6.50 (s, 1H), 4.55 (q, 2H), 1.43 (t, 3H), 1.32 (s, 9H).
273	δ 7.65 (s, 1H), 7.28 (s, 1H), 7.21 (t, 1H), 7.02 (d, 1H), 7.72 (d, 1H), 6.45 (s, 1H), 4.45 (m, 3H), 1.42 (t, 3H), 1.33 (d, 6H), 1.32 (s, 9H).
274	δ 8.8 (br m 1H, NH), 8.3 (d, 1H), 7.8 (m, 1H), 7.4 (d, 1H), 4.6 (q, 2H), 3.14 (s, 3H), 3.06 (s, 3H), 1.42 (t, 3H), 1.36 (s, 9H).
275	δ 8.8 (dd, 1H), 8.33 (br m, 1H, NH), 7.7 (m, 1H), 7.2 (m, 1H), 6.2 (br s, 1H), 4.6 (q, 2H), 3.5 (q, 2H), 1.37 (t, 3H), 1.29 (s, 9H), 1.24 (t, 3H).
276	δ 8.26 (dd, 1H), 8.3 (br m, 1H, NH), 7.2 (br s, 1H), 7.17 (m, 1H), 4.55 (q, 2H), 3.1 (s, 3H), 3.03 (s, 3H), 1.43 (t, 3H), 1.37 (s, 9H).
277	δ 8.78 (s, 1H), 8.52 (m, 1H), 7.60 (t, 1H), 6.52 (s, 1H), 4.59 (q, 2H), 3.42 (q, 2H), 1.37 (t, 3H), 1.34 (s, 9H), 1.28 (t, 3H).
278	δ 8.46 (dd, 1H), 8.32 (s, 1H), 7.62 (t, 1H), 6.60 (s, 1H), 4.59 (q, 2H), 4.28 (d, 2H), 2.30 (t, 1H), 1.42 (t, 3H), 1.34 (s, 9H).
279	δ 8.40 (s, 1H), 8.36 (m, 1H), 7.42 (t, 1H), 6.46 (s, 1H), 4.50 (q, 2H), 3.28 (q, 2H), 3.13 (s, 3H), 1.42 (t, 3H), 1.34 (s, 9H), 1.30 (t, 3H).
280	δ 8.40 (s, 1H), 8.38 (dd, 1H), 7.60 (t, 1H), 6.53 (s, 1H), 5.90 (m, 1H), 5.80 (m, 1H), 4.56 (q, 2H), 4.46 (m, 2H), 4.20 (m, 2H), 1.42 (t, 3H), 1.34 (s, 9H).
281	δ 9.24 (s, 1H), 8.58 (d, 1H), 8.22 (dd, 1H), 8.00 (d, 1H), 6.68 (s, 1H), 5.81 (m, 2H), 4.60 (m, 2H), 4.46 (m, 2H), 4.28 (m, 2H), 1.46 (t, 3H), 1.30 (s, 9H).
282	δ 8.56 (d, 1H), 8.32 (dd, 1H), 8.22 (t, 1H), 8.00 (d, 1H), 6.63 (s, 1H), 4.59 (q, 2H), 4.28 (d, 2H), 2.30 (t, 1H), 1.42 (t, 3H), 1.34 (s, 9H).
283	δ 8.51 (d, 1H), 8.42 (t, 1H), 8.38 (s, 1H), 8.22 (dd, 1H), 6.63 (s, 1H), 4.59 (q, 2H), 4.00 (m, 2H), 1.45 (t, 3H), 1.36 (s, 9H).
284	δ 9.00 (s, 1H), 8.48 (d, 1H), 8.40 (t, 1H), 8.36 (dd, 1H), 8.00 (s, 1H), 6.74 (s, 1H), 4.58 (m, 2H), 4.40 (t, 2H), 3.60 (m, 2H), 1.46 (t, 3H), 1.32 (s, 9H).
285	δ 8.80 (s, 1H), 7.84 (dd, 1H), 7.60 (s, 1H), 7.32 (m, 1H), 7.02 (m, 1H), 6.53 (s, 1H), 5.82 (m, 1H), 5.20 (m, 2H), 4.56 (q, 2H), 4.20 (m, 2H), 3.00 (s, 3H), 1.42 (t, 3H), 1.24 (s, 9H).

Cmpd No.	^1H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
286	δ 8.40 (s, 1H), 7.68 (m, 2H), 7.40 (m, 2H), 6.53 (s, 1H), 5.80 (m, 2H), 4.56 (q, 2H), 4.40 (m, 2H), 4.30 (m, 2H), 1.42 (t, 3H), 1.24 (s, 9H).
287	δ 9.60 (s, 1H), 8.60 (s, 1H), 8.40 (s, 1H), 6.59 (s, 1H), 4.58 (m, 2H), 3.16 (s, 3H), 3.08 (s, 3H), 1.44 (t, 3H), 1.32 (s, 9H).
288	δ 9.80 (s, 1H), 9.20 (s, 1H), 9.00 (s, 1H), 8.20 (s, 1H), 6.59 (s, 1H), 4.58 (m, 2H), 3.36 (q, 2H), 1.34 (t, 3H), 1.32 (s, 9H), 1.26 (t, 3H).
289	δ 9.78 (s, 1H), 9.18 (s, 1H), 8.40 (s, 1H), 7.72 (s, 1H), 6.64 (s, 1H), 4.58 (m, 2H), 4.26 (q, 2H), 2.24 (t, 1H), 1.34 (t, 3H), 1.32 (s, 9H).
290	δ 9.68 (s, 1H), 8.80 (s, 1H), 8.20 (s, 1H), 7.72 (s, 1H), 6.56 (s, 1H), 5.88 (m, 2H), 4.56 (q, 2H), 4.48 (m, 4H), 1.34 (t, 3H), 1.32 (s, 9H).
291	δ 9.82 (s, 1H), 9.20 (s, 1H), 8.40 (s, 1H), 7.82 (t, 1H), 6.66 (s, 1H), 4.58 (m, 2H), 4.06 (m, 2H), 1.34 (t, 3H), 1.32 (s, 9H), 1.26 (t, 3H).
294	δ 8.4 (d, 1H), 7.85 (br s, 1H), 7.1 (m, 2H), 6.5 (s, 1H), 4.5 (q, 2H), 3.6 (s, 3H), 3.2 (s, 3H), 1.4 (t, 3H), 1.3 (s, 9H).
295	δ 8.40 (s, 1H), 8.16 (s, 1H), 8.02 (d, 1H), 7.80 (dd, 1H), 7.40 (t, 1H), 6.56 (s, 1H), 4.54 (q, 2H), 4.40 (m, 2H), 1.45 (s, 3H), 1.42 (m, 6H), 1.00 (m, 2H), 0.80 (m, 2H).
296	δ 9.00 (dd, 1H), 7.80 (m, 1H), 7.76 (s, 1H), 7.20 (t, 1H), 6.42 (s, 1H), 4.54 (q, 2H), 4.40 (m, 2H), 1.45 (s, 3H), 1.42 (m, 6H), 1.00 (m, 2H), 0.80 (m, 2H).
297	δ 8.40 (s, 1H), 8.20 (d, 1H), 6.80 (d, 1H), 6.60 (dd, 1H), 6.42 (s, 2H), 4.56 (q, 2H), 3.92 (s,3H), 3.80 (s, 3H), 1.42 (t, 3H), 1.24 (s, 9H).
298	δ 7.80 (s, 1H), 7.60 (d, 1H), 7.00 (d, 1H), 6.80 (dd, 1H), 6.42 (s, 2H), 4.56 (q, 2H), 3.82 (s, 6H), 1.42 (t, 3H), 1.24 (s, 9H).
299	δ 8.40 (dd, 1H), 7.90 (s, 1H), 7.20 (m, 2H), 6.42 (s, 1H), 4.54 (q, 2H), 3.10 (s, 3H), 3.08 (s, 3H), 1.45 (s, 3H), 1.42 (m, 6H), 1.00 (m, 2H), 0.84 (m, 2H).
300	δ 8.48 (d, 1H), 8.00 (s, 1H), 7.90 (s, 1H), 7.62 (m, 2H), 6.42 (s, 1H), 4.54 (q, 2H), 3.40 (q, 2H), 1.45 (s, 3H), 1.42 (t, 3H), 1.20 (t, 3H), 1.00 (m, 2H), 0.84 (m, 2H).
301	δ 8.60 (dd, 1H), 7.90 (s, 1H), 7.20 (m, 2H), 6.42 (s, 1H), 5.84 (m, 2H), 4.51 (q, 2H), 4.30 (m, 4H), 1.45 (s, 3H), 1.42 (m, 6H), 1.00 (m, 2H), 0.84 (m, 2H).
302	δ 8.80 (m, 1H), 7.90 (s, 1H), 7.60 (m, 1H), 7.20 (m, 1H), 6.60 (s, 1H), 6.42 (s, 1H), 4.50 (q, 2H), 4.20 (m, 2H), 2.30 (m, 1H), 1.45 (s, 3H), 1.42 (m, 6H), 1.00 (m, 2H), 0.84 (m, 2H).
303	δ 8.20 (s, 1H), 7.70 (d, 1H), 7.60 (s, 2H), 7.40 (t, 1H), 7.20 (d, 1H), 6.42 (s, 1H), 4.54 (q, 2H), 3.10 (s, 3H), 3.00 (s, 3H), 1.45 (s, 3H), 1.42 (m, 6H), 1.00 (m, 2H), 0.84 (m, 2H).
304	δ 7.90 (s, 1H), 7.82 (s, 1H), 7.62 (dd, 1H), 7.40 (t, 1H), 7.30 (d, 1H), 6.42 (s, 1H), 5.80 (m, 2H), 4.54 (q, 2H), 4.40 (m, 4H), 1.45 (s, 3H), 1.42 (m, 6H), 1.00 (m, 2H), 0.84 (m, 2H).
306	δ 8.08 (s, 1H), 8.00 (s, 1H), 7.82 (dd, 1H), 7.40 (m, 2H), 6.42 (s, 1H), 6.20 (br s, 1H), 4.54 (q, 2H), 3.44 (q, 2H), 1.45 (s, 3H), 1.42 (m, 6H), 1.00 (m, 2H), 0.84 (m, 2H).
307	δ 9.32 (s, 1H), 8.58 (d, 1H), 7.15 (m, 2H), 3.68 (t, 1H), 3.57 and 3.33 (br m, 2H), 3.32 (dd, 1H), 3.18 (dq, 1H), 3.50 and 2.95 (br s, 3H, amide isomers), 2.94 (dq, 1H), 2.81 (d d, 1H), 1.23 (t, 3H), 1.17 (s, 9H).

Cmpd No.	^1H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
308	δ 9.32 (s, 1H), 8.42 (d, 1H), 7.12 (d, 2H), 3.68 (t, 1H), 3.5 (br s, 2H), 3.3 (br s, 2H), 3.3 (dd, 1H), 3.18 (m, 1H), 2.95 (m, 1H), 2.80 (dd, 1H), 1.34–1.17 (m, 18H).
309	δ 9.32 (s, 1H), 8.55 (d, 1H), 7.28 (m, 1H), 7.13 (dd, 1H), 3.68 (t, 1H), 3.62 (br m, 2H), 3.48 (br m, 2H), 3.31 (dd, 1H), 3.17 (dq, 1H), 2.95 (dq, 1H), 2.81 (dd, 1H), 1.9 (m, 4H), 1.23 (t, 3H), 1.17 (s, 9H).
310	δ 9.32 (s, 1H), 8.58 (d, 1H), 7.28 (m, 1H), 7.17 (dd, 1H), 5.92 (br s, 1H), 5.75 (br s, 1H), 4.43 (br s, 2H), 4.29 (br s, 2H), 3.69 (t, 1H), 3.31 (dd, 1H), 3.17 (dq, 1H), 2.95 (dq, 1H), 2.81 (dd, 1H), 1.23 (t, 3H), 1.17 (s, 9H).
311	δ 7.7 (m, 1H), 7.6 (m, 1H), 7.33–7.36 (m, 3H), 2.2 (s, 3H), 1.3 (s, 9H).
312	δ 8.70 (s, 1H, NH), 8.42 (m, 1H), 7.82 (d, 2H), 6.64 (s, 1H), 4.12 (s, 3H), 4.01 (s, 3H), 1.31 (s, 9H).
313	δ 8.42 (d, 1H), 7.92 (m, 2H), 7.80 (s, 1H, NH), 6.60 (s, 1H), 4.04 (s, 3H), 3.40 (q, 2H), 1.31 (s, 9H).
314	δ 8.50 (s, 1H, NH), 8.22 (d, 1H), 7.80 (t, 1H), 7.30 (d, 1H), 6.60 (s, 1H), 4.04 (s, 3H), 3.56 (q, 2H), 3.32 (q, 2H), 1.43 (s, 9H), 1.30 (t, 3H), 1.15 (t, 3H).
315	δ 8.39 (d, 1H), 8.20 (s, 1H, NH), 7.92 (d, 1H), 7.84 (t, 1H), 7.80 (s, 1H), 6.60 (s, 1H), 4.02 (s, 3H), 2.96 (m, 1H), 1.31 (s, 9H), 0.88 (m, 2H), 0.68 (m, 2H).
316	δ 8.42 (m, 2H), 7.92 (m, 1H, NH), 7.80 (s, 1H), 6.60 (s, 1H), 4.12 (m, 2H), 4.00 (s, 3H), 2.22 (m, 1H), 1.31 (s, 9H).
317	δ 8.42 (m, 2H), 7.92 (m, 1H, NH), 7.80 (s, 1H), 6.60 (s, 1H), 4.12 (m, 2H), 4.00 (s, 3H), 2.22 (m, 1H), 1.31 (s, 9H).
318	δ 8.46 (m, 2H, NH and 1 aromatic), 7.80 (m, 1H), 7.32 (dd, 1H), 6.55 (s, 1H), 5.82 (m, 1H), 5.34 (m, 2H), 4.20 (d, 2H), 4.02 (s, 3H), 1.30 (s, 9H).
319	δ 8.34 (s, 1H), 7.74 (d, 1H), 7.60 (s, 1H), 7.34 (t, 1H), 7.16 (s, 1H), 4.10 (m, 2H), 3.12 (q, 2H), 2.20 (m, 1H), 1.42 (s, 9H), 1.25 (t, 3H).
326	δ 8.45 (s, 1H), 7.72 (dd, 1H), 7.60 (s, 1H), 7.32 (t, 1H), 7.08 (d, 1H), 3.05 (s, 3H), 2.99 (s, 3H), 2.70 (s, 3H), 1.44 (s, 9H).
327	δ 8.80 (dd, 1H), 7.72 (m, 1H,), 7.20 (m, 1H), 5.86 (m, 2H,), 5.22 (m, 4H), 4.10 (m, 4H), 3.08 (q, 2H), 1.35 (s, 9H), 1.32 (t, 3H).
329	δ 7.42 (m, 3H), 7.10 (dd, 1H), 6.80 (s, 1H), 6.52 (s, 1H, NH), 4.50 (q, 2H), 4.20 (t, 2H), 2.28 (t, 2H), 2.20 (q, 2H), 1.42 (m, 6H), 1.38 (s, 9H).
331	δ 9.36 (br s, 1H), 8.42 (dd, 1H), 7.27 (m, 2H), 3.68 (t, 1H), 3.68 (br s, 2H), 3.38 (br s, 2H), 3.30 (dd, 1H), 3.18 (d of q, 1H), 2.95 (d of q, 1H), 2.80 (dd, 1H), 1.58–1.70 (m, 6H), 1.25 (t, 3H), 1.17 (s, 9H).
332	δ 7.62 (br s, 1H), 7.54 (br s, 1H), 7.36 (m, 2H), 6.90 (m, 1H), 6.47 (s, 1H), 4.56 (q, 2H), 1.45 (t, 3H), 1.32 (s, 9H).
333	δ 7.70 (br s, 1H), 7.60 (br s, 1H), 7.44 (d, 1H), 7.39 (t, 1H), 7.02 (d, 1H), 6.47 (s, 1H), 4.56 (q, 2H), 1.45 (t, 3H), 1.31 (s, 9H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
335	δ 9.38 (br s, 1H), 8.93 (dd, 1H), 7.67 (m, 1H), 7.13 (dd, 1H), 4.36 (q, 2H), 3.64 (dd, 1H), 3.53 (dd, 1H), 3.23 (t, 1H), 2.41 (m, 2H), 1.38 (t, 3H), 1.25 (s, 9H), 1.17 (t, 3H).
338	δ 8.41 (m, 1H), 7.83 (br s, 1H), 7.16 (dd, 1H), 6.92 (m, 2H), 7.47 (s, 1H), 4.56 (q, 2H), 1.45 (t, 3H), 1.32 (s, 9H).
340	δ 9.38 (br s, 1H), 8.47 (dd, 1H), 7.26 (m, 1H), 7.13 (dd, 1H), 5.90 (m, 1H), 5.73 (m, 1H), 4.43 (m, 2H), 4.32 (m, 2H), 3.64 (dd, 1H), 3.53 (dd, 1H), 3.24 (t, 1H), 2.41 (m, 2H), 1.25 (s, 9H), 1.17 (t, 3H).
341	δ 9.38 (br s, 1H), 8.45 (dd, 1H), 7.26 (m, 1H), 7.13 (dd, 1H), 3.62 (m, 3H), 3.43 (m, 3H), 3.23 (t, 1H), 2.41 (m, 2H), 1.90 (m, 2H), 1.23 (s, 9H), 1.16 (t, 3H).
342	δ 9.38 (br s, 1H); 8.38 (d, 1H), 7.13 (m, 2H); 3.62 (dd, 1H); 3.58 (br s, 1H); 3.53 (dd; 1H); 3.25 (br s, 1H); 3.23 (t, 1H); 3.02, 2.98 (br s, 3H); 2.41 (m, 2H); 1.23 (s, 9H); 1.16 (t, 3H); 1.14 (t, 3H).
343	δ 9.38 (br s, 1H); 8.38 (dd, 1H), 7.13 (m, 2H); 3.62 (dd, 1H); 3.52 (d of d; 1H); 3.23 (t, 1H); 3.09 (br s, 3H), 2.99 (br s, 3H); 2.41 (m, 2H); 1.23 (s, 9H); 1.16 (t, 3H).
346	δ 9.0 (br s 2H), 8.0 (m, 1H), 7.25 (m, 1H), 6.4 (s, 1H), 4.6 (q, 2H), 4.4 (q, 2H), 1.45 (t, 3H), 1.4 (t, 3H), 1.3 (s, 9H).
347	δ 8.56 (dd, 1H), 8.00 (br s, 1H, NH), 7.24 (m, 2H), 6.54 (s, 1H), 4.57 (q, 2H), 3.92 (s, 2H), 1.42 (t, 3H), 1.28 (s, 9H).
348	δ 8.14 (m, 1H), 8.00 (dd, 1H), 7.26 (s, 1H), 6.26 (s, 1H), 4.54 (q, 2H), 4.12 (q, 2H), 1.41 (m, 6H), 1.20 (s, 9H).
349	δ 8.65 (dd, 1H), 7.85 (br s, 1H), 7.65 (m, 1H), 7.6 (br s, 1H), 7.15 (dd, 1H), 6.5 (s, 1H), 4.6 (q, 2H), 3.85 (m, 2H), 1.4 (m, 3H), 1.3 (m, 3H), 1.25.
350	δ 8.56 (dd, 1H), 8.00 (br s, 1H, NH), 7.24 (m, 2H), 6.54 (s, 1H), 4.57 (q, 2H), 3.92 (m, 2H), 3.10 (m, 2H), 1.42 (t, 3H), 1.28 (s, 9H).
351	(DMSO-d_6) δ 13.1 (br s, NH), 10.0 (br s, NH), 8.4 (s, 1H), 8.2 (s, 1H), 7.9 (d, 1H), 7.5 (d, 1H), 7.3 (t, 1H), 6.5 (s, 1H) 3.2 (m, 2H), 1.3 (s, 9H), 1.1 (t, 3H).
353	δ 8.8 (m, 1H), 7.8(m, 1H), 7.7(m, 1H), 7.2(m, 1H), 6.2(br s, 1H), 4.63(q, 2H), 3.5(m, 2H), 2.9(t, 2H), 2.63 (t, 2H), 1.48(t, 3H), 1.35(s, 6H), 1.29(t, 3H).
354	δ 8.64 (br s. 1H), 7.91 (s, 1H), 7.71 (d, 1H), 7.40 (t, 1H), 7.28 (d, 1H), 5.90 (m, 1H), 5.76 (m, 1H), 4.96 (m, 1H), 4.45 (m, 2H), 4.28 (m, 2H), 3.03 (q, 2H), 2.20 (m, 4H), 1.93 (m, 2H), 1.74 (m, 2H), 1.31 (t, 3H).
355	δ 8.63 (br s. 1H), 7.76 (s, 1H), 7.72 (d, 1H), 7.38 (t, 1H), 7.16 (d, 1H), 4.96 (m, 1H), 3.06–3.16 (m, 8H), 2.20 (m, 4H), 1.93 (m, 2H), 1.74 (m, 2H), 1.31 (t, 3H).
356	δ 8.66 (br s. 1H), 8.06 (s, 1H), 7.83 (d, 1H), 7.54 (d, 1H), 7.39 (t, 1H), 6.41 (br s. 1H), 4.96 (m, 1H), 3.49 (m, 2H), 3.02 (q, 2H), 2.20 (m, 4H), 1.93 (m, 2H), 1.74 (m, 2H), 1.31 (t, 3H), 1.25 (t, 3H).
357	δ 8.62 (br s1H), 8.10 (s, 1H), 7.83 (d, 1H), 7.55 (d, 1H), 7.38 (t, 1H), 6.60 (br s 1H), 4.80 (m, 1H), 3.50 (m, 2H), 3.02 (q, 2H), 1.60 (d, 6H), 1.32 (t, 3H), 1.25 (t, 3H).

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
359	δ 8.64 (br s 1H), 7.92 (s, 1H), 7.71 (d, 1H), 7.41 (t, 1H), 7.28 (d, 1H), 5.91 (m, 1H), 5.76 (m, 1H), 4.79 (m, 1H), 4.45 (m, 2H), 4.28 (m, 2H), 3.03 (q, 2H), 1.60 (d, 6H), 1.31 (t, 3H).
361	δ 8.88 (br s1H), 8.58 (d, 1H), 7.18 (m, 2H), 3.40 (m, 8H), 1.70 (s, 9H), 1.32 (t, 3H).
362	δ 8.88 (br s 1H), 8.81 (dd, 1H), 7.67 (m, 1H), 7.18 (t, 1H), 6.60 (br s 1H), 3.48 (m, 2H), 3.01 (q, 2H), 1.70 (s, 9H), 1.31 (t, 3H), 1.25 (t, 3H).
363	δ 8.80 (br s 1H), 8.72 (dd, 1H), 7.30 (m, 1H), 7.19 (dd, 1H), 5.91 (m, 1H), 5.76 (m, 1H), 4.45 (m, 2H), 4.31 (m, 2H), 3.03 (q, 2H), 1.70 (s, 9H), 1.31 (t, 3H).
364	δ 8.67 (br s 1H), 7.75 (s, 1H), 7.74 (d, 1H), 7.38 (t, 1H), 7.16 (d, 1H), 3.04 (m, 8H), 1.70 (s, 9H), 1.31 (t, 3H).
366	δ 8.67 (br s 1H), 7.90 (s, 1H), 7.74 (d, 1H), 7.40 (t, 1H), 7.28 (d, 1H), 5.91 (m, 1H), 5.76 (m, 1H), 4.45 (m, 2H), 4.28 (m, 2H), 3.04 (q, 2H), 1.69 (s, 9H), 1.31 (t, 3H).

[a] ^{1}H NMR data are in ppm downfield from tetramethylsilane. Couplings are designated by (s)-singlet, (d)-doublet, (t)-triplet, (q)-quartet, (m)-multiplet, (dd)-doublet of doublets, (dt)-doublet of triplets, (dq)-doublet of quartets, (br s)-broad singlet, (br d)-broad d, (br m)-broad multiplet

BIOLOGICAL EXAMPLES OF THE INVENTION

TEST A

Seeds of plant species selected from barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.), downy bromegrass (*Bromus tectorum* L.), large crabgrass (*Digitaria sanguinalis* (L.) Scop.), giant foxtail (*Setaria faberi* Herrm.), morningglory (*Ipomoea* spp.), redroot pigweed (*Amaranthus retroflexus* L.) and velvetleaf (*Abutilon theophrasti* Medik.) were planted into a sandy loam soil and treated preemergence with a directed soil spray using test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant. At the same time plants selected from these species were also treated postemergence by spraying to runoff with test chemicals formulated.

Plants ranged in height from 2 to 10 cm and were in the one- to two-leaf stage for the postemergence treatment. Treated plants and untreated controls were maintained in a greenhouse for approximately ten days, after which time all treated plants were compared to untreated controls and visually evaluated for injury. Plant response ratings, summarized in Table A, are based on a 0 to 100 scale where 0 is no effect and 100 is complete control. A dash (–) response means no test results.

Table A	Compounds													
2000 g ai/ha	2	3	4	5	6	8	27	28	30	33	34	35	36	40
Postemergence														
Barnyardgrass	100	100	100	90	90	0	75	65	70	90	80	85	80	0
Crabgrass, Large	100	95	70	50	90	0	70	20	25	85	50	60	10	0
Foxtail, Giant	100	100	80	45	70	0	70	25	55	85	40	70	35	0

Morningglory	80	20	35	15	30	0	100	25	0	25	20	10	10	0
Pigweed	100	100	100	90	100	45	90	80	65	85	90	95	85	0
Velvetleaf	75	60	45	20	95	5	45	25	20	40	30	40	20	0

Table A							Compounds							
2000 g ai/ha	41	43	44	45	46	47	52	53	54	55	58	59	60	61
Postemergence														
Barnyardgrass	60	100	100	100	100	100	55	0	10	100	80	30	70	90
Crabgrass, Large	60	90	80	90	90	100	20	0	15	100	75	20	55	45
Foxtail, Giant	35	70	90	95	100	85	25	0	5	80	60	20	60	85
Morningglory	10	30	45	25	65	25	0	0	10	25	0	10	20	20
Pigweed	60	100	100	100	100	100	35	0	20	100	90	75	95	95
Velvetleaf	25	30	65	65	75	40	20	0	5	40	40	20	20	15

Table A							Compounds							
2000 g ai/ha	62	63	64	65	66	67	70	71	78	79	80	82	83	84
Postemergence														
Barnyardgrass	100	90	75	75	0	25	30	0	40	40	90	20	20	10
Crabgrass, Large	60	80	60	60	0	20	30	0	35	55	90	30	25	20
Foxtail, Giant	85	80	55	55	0	20	30	0	60	40	90	20	20	10
Morningglory	20	15	10	10	0	20	30	0	25	25	50	10	10	10
Pigweed	100	100	95	70	10	85	75	0	90	85	100	50	55	45
Velvetleaf	20	55	30	35	0	15	30	0	50	50	75	30	20	20

Table A							Compounds							
2000 g ai/ha	85	86	87	88	89	90	91	92	93	94	95	96	97	98
Postemergence														
Barnyardgrass	25	20	55	100	20	20	0	0	25	35	55	80	10	0
Crabgrass, Large	30	25	60	95	25	25	20	10	15	30	60	70	10	0
Foxtail, Giant	30	20	50	60	20	20	0	0	10	15	50	80	10	0
Morningglory	25	35	20	40	15	10	0	0	10	20	15	15	0	0
Pigweed	70	95	35	100	30	40	20	0	30	30	100	100	25	10
Velvetleaf	30	30	25	55	20	30	10	0	15	25	50	70	10	5

Table A							Compounds							
2000 g ai/ha	102	103	107	108	109	111	112	114	115	116	117	120	121	122
Postemergence														
Barnyardgrass	75	75	55	100	90	0	45	40	80	35	75	65	35	85
Crabgrass, Large	80	30	40	85	55	10	30	60	80	10	65	65	10	65
Foxtail, Giant	65	30	35	100	90	0	35	55	80	0	55	20	25	80
Morningglory	55	35	40	40	40	0	15	25	30	0	70	40	20	65

Pigweed	100	100	100	100	100	10	60	100	100	0	95	85	100	100
Velvetleaf	20	45	0	100	45	0	35	20	40	0	65	30	15	70

Table A	Compounds													
2000 g ai/ha	123	124	125	127	128	130	136	137	138	139	143	144	145	146
Postemergence														
Barnyardgrass	20	0	0	50	80	20	60	25	30	60	25	100	100	75
Crabgrass, Large	10	10	0	35	70	20	70	60	30	30	30	90	85	55
Foxtail, Giant	10	0	0	30	60	10	50	30	35	40	15	100	60	40
Morningglory	10	0	0	20	15	25	40	40	40	35	25	35	30	0
Pigweed	15	40	20	50	80	65	85	100	100	100	35	100	100	100
Velvetleaf	10	10	0	0	35	20	75	70	60	40	15	75	55	35

Table A	Compounds													
2000 g ai/ha	147	148	149	150	151	153	154	164	165	166	167	172	179	180
Postemergence														
Barnyardgrass	95	25	65	65	10	100	90	10	0	10	0	0	10	30
Crabgrass, Large	90	10	75	50	10	20	30	10	0	0	5	0	10	35
Foxtail, Giant	90	15	65	25	10	90	20	0	0	20	0	0	10	20
Morningglory	30	10	60	10	20	85	40	5	5	10	10	10	30	15
Pigweed	100	15	90	75	70	100	100	0	5	25	0	60	10	95
Velvetleaf	50	15	40	15	60	65	30	0	20	30	30	15	5	15

Table A	Compounds													
2000 g ai/ha	189	190	195	196	197	198	199	200	201	202	203	204	205	206
Postemergence														
Barnyardgrass	10	0	50	30	0	80	80	35	20	80	30	30	65	10
Crabgrass, Large	10	15	25	0	10	65	50	35	20	65	15	30	30	5
Foxtail, Giant	0	0	0	0	5	65	65	20	10	50	20	25	25	0
Morningglory	10	25	10	0	0	75	70	45	30	75	55	15	20	0
Pigweed	45	20	25	0	5	75	80	60	55	90	80	60	65	20
Velvetleaf	5	15	15	0	5	35	35	10	10	30	10	60	30	30

Table A	Compounds													
2000 g ai/ha	207	209	210	211	212	213	214	215	216	217	222	223	255	267
Postemergence														
Barnyardgrass	70	70	80	55	90	45	15	25	15	0	90	55	70	65
Crabgrass, Large	65	40	65	30	60	30	10	30	20	20	85	25	40	75
Foxtail, Giant	50	25	75	30	80	35	40	40	20	0	85	10	55	55
Morningglory	15	15	25	15	20	10	10	35	20	25	95	60	25	45
Pigweed	45	50	80	25	90	40	50	80	55	25	100	55	100	60

Velvetleaf	25	20	65	25	35	25	20	30	35	30	100	35	50	35

Table A	Compounds													
2000 g ai/ha	268	269	270	271	272	273	277	278	279	280	281	282	283	284
Postemergence														
Barnyardgrass	80	80	30	30	90	75	50	60	40	25	65	80	35	60
Crabgrass, Large	75	80	10	10	90	65	0	5	20	0	10	25	10	20
Foxtail, Giant	80	65	0	20	95	70	0	15	20	0	25	25	25	35
Morningglory	40	35	20	30	100	75	0	5	5	10	15	15	0	15
Pigweed	85	50	0	90	100	100	35	70	60	70	70	100	100	100
Velvetleaf	45	30	25	40	100	95	30	25	20	30	40	50	35	35

Table A	Compounds													
2000 g ai/ha	285	286	287	288	289	290	291	300	312	313	314	315	316	317
Postemergence														
Barnyardgrass	80	80	90	65	40	70	40	90	0	95	75	20	45	0
Crabgrass, Large	35	35	60	15	20	10	25	90	0	100	60	20	45	10
Foxtail, Giant	55	75	90	10	70	70	75	90	0	80	70	0	30	0
Morningglory	50	35	15	20	20	30	10	95	0	55	50	0	30	0
Pigweed	100	85	80	40	50	60	30	100	0	100	100	20	80	10
Velvetleaf	75	50	65	20	5	30	10	80	0	50	30	0	20	0

Table A	Compounds								
2000 g ai/ha	318	319	329	338	347	348	354	355	356
Postemergence									
Barnyardgrass	90	60	20	35	0	0	70	75	40
Crabgrass, Large	70	50	5	45	0	0	20	30	15
Foxtail, Giant	90	40	20	30	0	0	50	45	10
Morningglory	55	25	20	70	0	0	85	75	20
Pigweed	100	40	45	95	0	0	80	90	70
Velvetleaf	50	30	25	60	0	0	70	65	10

Table A	Compounds							
1000 g ai/ha	31	32	39	131	132	133	134	135
Postemergence								
Barnyardgrass	75	0	55	60	30	55	70	50
Crabgrass, Large	40	0	35	40	25	20	35	30
Foxtail, Giant	70	0	45	15	20	20	35	30
Morningglory	20	0	0	15	20	20	20	10
Pigweed	80	0	75	75	65	75	100	85
Velvetleaf	30	0	10	10	30	15	20	25

Table A	Compounds													
500 g ai/ha	2	3	4	5	6	8	27	28	30	33	34	35	36	38
Postemergence														
Barnyardgrass	100	100	80	30	80	0	80	65	70	75	45	70	35	55
Crabgrass, Large	85	75	20	20	80	0	50	30	25	65	30	55	10	60
Foxtail, Giant	95	95	20	25	70	0	60	20	20	70	30	50	20	60
Morningglory	45	25	15	10	10	0	35	5	0	10	10	10	10	0
Pigweed	100	100	95	25	100	20	90	70	60	85	90	85	80	70
Velvetleaf	40	40	20	10	90	5	25	25	25	30	20	25	15	20

Table A	Compounds													
500 g ai/ha	40	41	43	44	45	46	47	51	52	53	54	55	58	59
Postemergence														
Barnyardgrass	0	30	90	90	100	100	90	75	25	0	10	90	70	20
Crabgrass, Large	15	20	65	55	90	75	85	30	0	5	10	25	40	15
Foxtail, Giant	0	20	70	50	90	80	90	40	25	0	10	30	45	15
Morningglory	0	10	20	15	25	40	20	35	0	0	0	20	10	10
Pigweed	0	40	100	100	100	100	100	85	30	0	20	90	70	40
Velvetleaf	0	25	15	45	40	45	25	40	10	0	0	35	20	15

Table A	Compounds													
500 g ai/ha	60	61	62	63	64	65	66	67	70	71	78	79	80	82
Postemergence														
Barnyardgrass	35	35	65	60	30	45	0	0	25	0	30	40	90	20
Crabgrass, Large	20	30	25	40	30	30	0	20	25	0	20	20	70	20
Foxtail, Giant	30	20	55	50	30	30	0	10	30	0	20	30	80	20
Morningglory	10	10	10	15	10	10	0	5	25	0	15	15	40	20
Pigweed	40	85	100	95	65	70	10	50	60	0	85	95	100	50
Velvetleaf	20	15	10	40	20	25	0	20	20	0	45	45	60	20

Table A	Compounds													
500 g ai/ha	83	84	85	86	87	88	89	90	91	92	93	94	95	96
Postemergence														
Barnyardgrass	5	15	20	20	15	85	20	20	0	0	20	20	30	60
Crabgrass, Large	30	20	20	20	20	85	20	15	10	0	10	10	25	30
Foxtail, Giant	20	15	20	20	30	20	20	20	0	0	10	10	20	60
Morningglory	10	5	20	20	15	35	20	10	0	0	5	20	10	10
Pigweed	45	50	75	55	10	90	20	20	0	0	20	25	85	95
Velvetleaf	20	30	30	40	10	40	20	10	5	0	10	20	45	70

Table A	Compounds													
500 g ai/ha	97	98	102	103	107	108	109	110	111	112	114	115	116	117
Postemergence														
Barnyardgrass	5	0	55	45	20	85	75	30	0	35	30	70	0	45
Crabgrass, Large	10	0	60	15	25	65	20	30	10	25	40	75	0	40
Foxtail, Giant	5	0	45	10	20	90	55	25	0	20	50	60	0	35
Morningglory	0	0	35	25	30	40	25	10	5	20	10	35	0	20
Pigweed	0	5	95	85	95	100	100	50	5	40	85	95	0	80
Velvetleaf	5	0	10	10	0	90	25	10	0	25	20	40	0	50

Table A	Compounds													
500 g ai/ha	120	121	122	123	124	125	127	128	130	136	137	138	139	143
Postemergence														
Barnyardgrass	45	10	75	5	0	0	30	70	20	55	20	15	35	10
Crabgrass, Large	50	10	35	10	10	0	15	60	20	35	30	20	0	20
Foxtail, Giant	20	15	80	0	0	0	30	45	10	25	20	20	20	10
Morningglory	20	20	30	0	5	0	10	10	20	20	25	15	20	10
Pigweed	50	90	60	0	30	20	40	50	50	65	90	60	75	20
Velvetleaf	25	10	45	0	10	0	0	20	20	55	60	20	25	0

Table A	Compounds													
500 g ai/ha	144	145	146	147	148	149	150	151	153	154	164	165	166	167
Postemergence														
Barnyardgrass	85	40	50	55	20	45	30	10	75	50	10	0	0	0
Crabgrass, Large	55	30	15	40	5	40	15	5	10	20	10	0	0	0
Foxtail, Giant	80	40	15	45	15	40	20	10	20	20	0	0	0	0
Morningglory	25	15	5	20	15	30	0	10	35	20	10	5	0	0
Pigweed	100	90	85	90	0	65	80	35	95	90	0	0	20	0
Velvetleaf	55	30	20	30	20	30	25	35	40	10	5	10	20	10

Table A	Compounds													
500 g ai/ha	172	179	180	189	190	195	196	197	198	199	200	201	202	203
Postemergence														
Barnyardgrass	0	5	20	0	0	15	0	10	45	10	10	10	45	10
Crabgrass, Large	0	10	20	10	10	10	0	5	20	15	10	10	30	10
Foxtail, Giant	0	0	15	0	0	5	0	0	30	25	0	0	30	10
Morningglory	10	10	10	10	10	10	5	0	60	45	35	25	75	50
Pigweed	25	0	30	30	10	5	0	0	55	80	50	40	50	35
Velvetleaf	5	0	10	5	0	0	0	5	30	30	10	10	30	10

Table A	Compounds													
500 g ai/ha	204	205	206	207	209	210	211	212	213	214	215	216	217	222
Postemergence														
Barnyardgrass	25	45	5	40	30	80	25	50	25	0	0	0	0	75
Crabgrass, Large	30	10	0	20	20	40	20	45	20	5	20	20	0	80
Foxtail, Giant	25	10	0	10	15	40	20	45	20	15	25	20	0	65
Morningglory	20	25	0	20	0	20	20	15	20	0	25	20	15	80
Pigweed	50	50	15	30	40	60	25	75	30	20	70	30	10	75
Velvetleaf	40	20	5	20	10	40	15	35	30	15	30	25	5	80

Table A	Compounds													
500 g ai/ha	223	255	267	268	269	270	271	272	273	277	278	279	280	281
Postemergence														
Barnyardgrass	10	40	40	80	70	0	10	55	55	0	30	20	0	30
Crabgrass, Large	20	20	45	50	35	0	10	55	25	0	10	10	5	5
Foxtail, Giant	10	30	30	55	35	0	10	45	50	0	5	10	0	0
Morningglory	50	10	30	20	20	20	10	100	70	0	10	5	0	10
Pigweed	50	70	40	35	35	20	45	100	100	10	60	70	55	70
Velvetleaf	40	35	30	45	25	15	10	100	90	25	20	20	20	35

Table A	Compounds													
500 g ai/ha	282	283	284	285	286	287	288	289	290	291	300	311	312	313
Postemergence														
Barnyardgrass	40	10	30	55	60	70	5	10	55	25	75	10	0	80
Crabgrass, Large	10	10	20	15	20	10	0	20	10	5	55	10	0	70
Foxtail, Giant	20	10	20	25	35	40	0	10	15	30	55	0	0	70
Morningglory	15	0	10	40	20	20	20	10	20	5	80	0	0	30
Pigweed	75	80	95	80	55	50	20	20	30	20	90	0	0	100
Velvetleaf	50	15	30	60	30	55	20	0	20	5	60	10	0	40

Table A	Compounds												
500 g ai/ha	314	315	316	317	318	319	329	338	347	348	354	355	356
Postemergence													
Barnyardgrass	35	20	20	0	65	10	15	20	0	0	20	40	25
Crabgrass, Large	20	20	25	10	30	10	10	20	0	0	10	10	10
Foxtail, Giant	30	0	20	0	50	0	10	20	0	0	10	10	10
Morningglory	30	0	20	0	50	15	10	25	0	0	30	15	10
Pigweed	80	10	25	0	95	40	10	70	0	0	70	40	65
Velvetleaf	20	0	15	0	40	20	10	40	0	0	50	15	10

Table A	Compounds							
250 g ai/ha	31	32	39	131	132	133	134	135
Postemergence								
Barnyardgrass	65	0	10	25	20	20	30	30
Crabgrass, Large	30	0	10	20	20	10	20	20
Foxtail, Giant	45	0	10	10	15	10	15	20
Morningglory	5	0	0	15	10	10	10	10
Pigweed	55	0	70	45	75	30	85	80
Velvetleaf	20	0	10	15	20	10	20	15

Table A	Compounds			
125 g ai/ha	38	51	110	311
Postemergence				
Barnyardgrass	40	50	30	0
Crabgrass, Large	30	30	25	0
Foxtail, Giant	50	20	20	0
Morningglory	0	10	0	0
Pigweed	50	50	40	0
Velvetleaf	10	40	10	0

Table A	Compounds													
2000 g ai/ha	2	3	4	5	6	8	27	28	30	33	34	35	36	40
Preemergence														
Barnyardgrass	100	90	95	95	100	10	90	65	75	80	80	90	75	15
Crabgrass, Large	100	90	95	95	100	10	90	55	60	95	100	100	70	15
Foxtail, Giant	100	100	95	80	100	5	100	45	65	95	85	100	85	5
Morningglory	100	90	60	20	80	-	80	30	50	70	50	85	70	10
Pigweed	100	100	100	100	100	75	100	90	100	100	100	100	100	15
Velvetleaf	100	90	100	75	100	25	100	75	55	80	25	95	90	15

Table A	Compounds													
2000 g ai/ha	41	43	44	45	46	47	52	53	54	55	58	59	60	61
Preemergence														
Barnyardgrass	75	90	90	95	100	95	90	10	25	95	75	60	85	75
Crabgrass, Large	80	90	90	75	90	90	90	40	35	100	95	45	95	90
Foxtail, Giant	70	100	100	100	100	100	60	0	15	100	95	65	90	75
Morningglory	45	40	30	75	65	30	10	0	15	20	40	40	40	50
Pigweed	85	100	100	100	100	100	90	40	65	100	100	100	100	65
Velvetleaf	40	60	35	65	85	95	50	0	0	70	65	55	95	85

Table A	Compounds													
2000 g ai/ha	62	63	64	65	66	67	70	71	78	79	80	82	83	84
Preemergence														
Barnyardgrass	95	100	85	70	20	30	20	0	45	35	35	0	0	0
Crabgrass, Large	85	100	100	100	0	55	45	0	90	55	30	0	0	0
Foxtail, Giant	100	100	90	80	0	30	55	0	70	40	70	0	0	0
Morningglory	75	70	5	5	0	30	10	0	40	60	30	15	10	-
Pigweed	100	100	100	100	0	90	5	0	90	90	90	35	0	0
Velvetleaf	95	70	35	30	0	75	20	0	50	70	10	0	0	0

Table A	Compounds													
2000 g ai/ha	85	86	87	88	89	90	91	92	93	94	95	96	97	98
Preemergence														
Barnyardgrass	0	0	90	90	0	50	15	0	40	65	50	90	0	0
Crabgrass, Large	5	0	95	100	0	75	35	0	70	60	90	100	0	0
Foxtail, Giant	0	0	90	90	0	60	30	0	60	65	90	95	0	0
Morningglory	5	15	15	40	10	30	10	0	20	10	55	70	0	0
Pigweed	5	55	95	100	10	70	55	35	70	85	100	100	0	0
Velvetleaf	0	10	65	70	10	35	20	0	25	25	80	100	0	0

Table A	Compounds													
2000 g ai/ha	102	103	107	108	109	111	112	114	115	116	117	120	121	122
Preemergence														
Barnyardgrass	85	85	35	90	90	10	50	40	85	70	70	85	40	95
Bromegrass, Downy	50	-	-	-	-	-	-	-	-	-	-	-	-	-
Crabgrass, Large	100	55	90	100	95	30	55	85	100	80	75	75	75	95
Foxtail, Giant	85	15	80	100	90	75	50	45	80	35	60	55	75	85
Morningglory	90	10	100	75	45	0	45	70	90	10	75	55	20	30
Pigweed	90	95	95	100	100	10	90	90	100	0	90	50	100	90
Velvetleaf	60	20	0	90	25	0	50	60	95	0	65	40	30	70

Table A	Compounds													
2000 g ai/ha	123	124	125	127	128	130	136	137	138	139	143	144	145	146
Preemergence														
Barnyardgrass	50	10	0	30	85	30	85	60	80	60	0	100	100	80
Crabgrass, Large	0	15	0	85	100	60	90	90	90	75	15	90	90	80
Foxtail, Giant	0	0	0	35	65	55	70	80	90	75	0	100	100	45
Morningglory	0	15	0	30	85	15	45	35	45	85	0	75	25	50
Pigweed	0	75	0	50	95	65	80	90	95	100	0	100	100	95
Velvetleaf	0	15	0	30	85	30	30	35	50	80	0	90	90	25

Table A	Compounds													
2000 g ai/ha	147	148	149	150	151	153	154	164	165	166	167	172	179	180
Preemergence														
Barnyardgrass	95	20	90	80	0	90	95	0	0	10	0	0	40	0
Crabgrass, Large	90	15	100	50	0	25	85	0	0	30	5	0	50	50
Foxtail, Giant	95	10	100	55	0	60	70	0	0	10	10	0	10	10
Morningglory	45	5	65	35	0	55	30	0	0	5	5	0	5	10
Pigweed	100	25	95	100	0	100	100	0	20	10	50	40	35	90
Velvetleaf	85	10	25	50	10	80	60	0	5	5	10	0	0	15

Table A	Compounds													
2000 g ai/ha	189	190	195	196	197	198	199	200	201	202	203	204	205	206
Preemergence														
Barnyardgrass	65	40	45	55	0	90	95	45	50	80	60	5	90	60
Crabgrass, Large	75	70	95	50	0	90	100	75	70	100	75	10	95	20
Foxtail, Giant	20	10	45	20	0	95	100	60	15	80	75	10	100	20
Morningglory	30	25	10	10	5	85	55	60	5	70	15	25	45	25
Pigweed	40	85	0	15	0	100	100	95	95	100	90	10	100	60
Velvetleaf	25	15	15	0	10	85	90	35	35	85	35	25	100	10

Table A	Compounds													
2000 g ai/ha	207	209	210	211	212	213	214	215	216	217	222	233	255	267
Preemergence														
Barnyardgrass	80	80	90	70	85	70	30	35	35	0	100	80	75	80
Crabgrass, Large	90	95	100	65	95	95	65	55	55	10	95	90	55	90
Foxtail, Giant	90	90	100	70	95	85	55	75	70	10	100	90	60	85
Morningglory	85	40	100	25	65	60	30	55	15	0	100	55	70	45
Pigweed	100	100	100	40	100	95	95	85	70	40	90	90	100	80
Velvetleaf	100	75	95	65	100	35	20	30	30	5	100	85	50	60

Table A	Compounds													
2000 g ai/ha	268	269	270	271	272	273	277	278	279	280	281	282	283	284
Preemergence														
Barnyardgrass	100	100	90	75	100	95	70	60	55	45	75	75	30	85
Crabgrass, Large	100	100	35	15	100	100	25	60	70	35	65	65	90	80
Foxtail, Giant	100	100	70	70	100	100	55	85	60	45	75	40	50	55
Morningglory	25	30	30	0	55	80	0	25	20	15	25	40	10	5
Pigweed	100	100	85	60	100	100	70	95	100	90	95	90	90	100
Velvetleaf	100	100	55	5	60	75	45	35	30	30	35	45	15	40

Table A	Compounds													
2000 g ai/ha	285	286	287	288	289	290	291	300	312	313	314	315	316	317
Preemergence														
Barnyardgrass	90	85	100	75	50	90	25	100	0	90	90	5	10	0
Crabgrass, Large	85	70	100	10	55	25	10	100	0	95	90	15	35	10
Foxtail, Giant	90	100	100	75	40	90	0	100	0	90	90	10	0	0
Morningglory	45	40	50	30	15	40	0	100	0	55	30	10	0	0
Pigweed	100	95	100	70	75	95	35	100	0	100	90	45	65	30
Velvetleaf	40	70	100	40	20	30	0	100	0	80	80	30	15	30

Table A	Compounds								
2000 g ai/ha	318	319	329	338	347	348	354	355	356
Preemergence									
Barnyardgrass	95	80	5	95	0	0	55	80	45
Crabgrass, Large	70	100	0	100	0	0	20	50	20
Foxtail, Giant	85	80	5	100	0	0	80	60	45
Morningglory	50	60	10	40	0	0	20	40	15
Pigweed	100	100	10	90	0	0	70	50	80
Velvetleaf	80	45	10	50	0	0	45	55	20

Table A	Compounds							
1000 g ai/ha	31	32	39	131	132	133	134	135
Preemergence								
Barnyardgrass	80	0	25	50	10	45	45	65
Crabgrass, Large	45	0	85	85	35	80	95	90
Foxtail, Giant	50	0	40	75	40	30	45	50
Morningglory	55	0	20	35	10	0	30	25
Pigweed	80	0	100	90	40	65	100	85
Velvetleaf	35	0	20	60	20	35	40	50

Table A	Compounds													
500 g ai/ha	2	3	4	5	6	8	27	28	30	33	34	35	36	38
Preemergence														
Barnyardgrass	100	90	90	50	100	0	75	45	45	55	55	70	45	5
Crabgrass, Large	100	95	90	80	100	10	85	75	50	90	60	95	10	10
Foxtail, Giant	100	100	90	40	100	10	90	30	30	80	40	80	5	0
Morningglory	80	55	15	10	45	0	55	45	25	35	35	25	20	10
Pigweed	100	100	100	80	100	40	100	95	90	100	100	100	95	0
Velvetleaf	100	95	80	25	100	0	75	60	50	20	20	35	20	5

Table A	Compounds													
500 g ai/ha	40	41	43	44	45	46	47	51	52	53	54	55	58	59
Preemergence														
Barnyardgrass	0	40	60	75	80	90	90	85	25	0	5	80	65	25
Crabgrass, Large	5	40	75	45	55	65	55	80	70	0	25	75	70	25
Foxtail, Giant	0	30	55	65	75	90	90	100	20	0	0	60	85	5
Morningglory	5	20	10	10	15	40	20	15	0	0	0	5	20	10
Pigweed	0	65	100	100	95	100	100	100	90	30	10	100	100	90
Velvetleaf	5	25	5	20	25	30	20	100	15	0	0	20	70	15

Table A	Compounds													
500 g ai/ha	60	61	62	63	64	65	66	67	70	71	78	79	80	82
Preemergence														
Barnyardgrass	50	40	50	70	55	55	0	0	20	0	20	20	10	0
Crabgrass, Large	75	75	70	90	70	95	0	15	35	0	60	50	10	0
Foxtail, Giant	55	20	75	95	40	40	0	0	40	0	55	10	20	0
Morningglory	10	20	20	10	0	5	0	0	20	0	25	20	15	0
Pigweed	95	95	100	100	100	100	0	0	0	0	80	45	70	5
Velvetleaf	65	55	70	20	10	10	0	30	10	0	30	20	10	0

Table A	Compounds													
500 g ai/ha	83	84	85	86	87	88	89	90	91	92	93	94	95	96
Preemergence														
Barnyardgrass	0	0	0	0	55	75	0	20	0	0	25	20	30	70
Crabgrass, Large	0	0	0	0	90	45	0	35	0	0	35	35	50	80
Foxtail, Giant	0	0	0	0	35	55	0	25	0	0	35	45	70	75
Morningglory	30	0	0	0	15	10	0	0	0	0	5	10	30	25
Pigweed	0	0	0	0	60	90	0	25	0	0	40	35	100	100
Velvetleaf	0	0	0	0	25	45	0	20	5	0	10	5	50	95

Table A	Compounds													
500 g ai/ha	97	98	102	103	107	108	109	110	111	112	114	115	116	117
Preemergence														
Barnyardgrass	0	0	70	55	0	85	85	5	0	25	25	70	35	30
Bromegrass, Downy	–	–	60	–	–	–	–	–	–	–	–	–	–	–
Crabgrass, Large	0	0	95	35	65	85	80	20	25	45	40	100	45	45
Foxtail, Giant	0	0	60	0	10	95	80	0	45	25	30	50	20	25
Morningglory	0	0	65	0	95	30	35	20	0	20	35	70	0	45
Pigweed	0	0	80	80	35	100	75	10	10	65	85	95	0	55
Velvetleaf	0	0	30	20	0	55	15	10	0	25	35	85	0	50

Table A							Compounds							
500 g ai/ha	120	121	122	123	124	125	127	128	130	136	137	138	139	143
Preemergence														
Barnyardgrass	30	15	90	5	0	0	20	55	40	65	30	30	40	0
Crabgrass, Large	45	10	70	15	30	0	75	90	45	85	55	70	45	0
Foxtail, Giant	25	25	65	0	0	0	20	15	50	60	50	30	60	0
Morningglory	20	5	25	0	5	0	30	45	10	20	20	15	30	0
Pigweed	20	95	85	0	20	0	40	60	35	70	60	80	100	0
Velvetleaf	20	10	40	0	0	0	10	75	20	25	20	20	50	0

Table A							Compounds							
500 g ai/ha	144	145	146	147	148	149	150	151	153	154	164	165	166	167
Preemergence														
Barnyardgrass	100	95	70	40	0	70	50	0	80	30	0	0	0	0
Crabgrass, Large	90	70	70	85	0	95	25	0	25	25	0	0	0	0
Foxtail, Giant	90	85	45	60	0	70	15	0	15	20	0	0	0	0
Morningglory	20	20	5	20	0	30	10	0	10	10	0	0	0	0
Pigweed	100	95	85	85	0	90	75	0	100	85	0	0	0	0
Velvetleaf	70	75	20	25	0	0	20	0	15	15	0	0	0	5

Table A							Compounds							
500 g ai/ha	172	179	180	189	190	195	196	197	198	199	200	201	202	203
Preemergence														
Barnyardgrass	0	0	0	35	20	20	15	0	55	55	35	0	45	10
Crabgrass, Large	0	0	10	55	40	75	25	0	80	70	70	35	85	50
Foxtail, Giant	0	0	0	5	0	30	0	0	90	80	35	0	55	30
Morningglory	0	0	0	15	10	5	0	0	45	15	15	0	15	10
Pigweed	0	0	0	25	25	0	0	0	95	100	80	40	100	90
Velvetleaf	0	0	0	10	0	0	0	0	45	35	20	0	35	15

Table A							Compounds							
500 g ai/ha	204	205	206	207	209	210	211	212	213	214	215	216	217	222
Preemergence														
Barnyardgrass	0	80	10	70	60	85	55	80	40	0	15	15	0	95
Crabgrass, Large	0	80	20	95	75	90	75	90	55	55	30	15	0	100
Foxtail, Giant	0	85	0	75	50	100	45	70	60	60	50	25	0	95
Morningglory	10	30	5	35	20	55	10	30	25	5	20	0	0	75
Pigweed	0	100	25	100	75	100	30	100	75	20	30	0	0	90
Velvetleaf	5	70	15	30	10	70	25	65	15	5	15	10	0	95

Table A	Compounds													
500 g ai/ha	223	255	267	268	269	270	271	272	273	277	278	279	280	281
Preemergence														
Barnyardgrass	55	55	70	100	95	60	5	70	70	0	50	5	0	60
Crabgrass, Large	90	35	15	85	65	5	0	85	75	0	25	70	0	20
Foxtail, Giant	75	45	75	100	100	20	0	90	85	0	60	25	5	60
Morningglory	35	30	20	5	20	0	0	20	45	0	10	10	0	5
Pigweed	95	90	5	100	100	15	60	100	100	40	85	95	15	90
Velvetleaf	55	30	25	95	40	30	0	15	60	5	20	10	0	10

Table A	Compounds													
500 g ai/ha	282	283	284	285	286	287	288	289	290	291	300	311	312	313
Preemergence														
Barnyardgrass	30	0	10	70	75	95	20	0	40	0	90	0	0	80
Crabgrass, Large	40	15	15	60	15	75	0	0	5	0	90	0	0	85
Foxtail, Giant	10	10	30	60	60	65	15	10	50	0	95	0	0	75
Morningglory	10	0	0	25	30	10	5	0	10	0	90	0	0	20
Pigweed	90	60	85	100	85	100	25	0	10	0	95	0	0	95
Velvetleaf	20	0	10	35	20	50	10	0	15	0	85	0	0	65

Table A	Compounds												
500 g ai/ha	314	315	316	317	318	319	329	338	347	348	354	355	356
Preemergence													
Barnyardgrass	50	5	0	0	65	55	0	60	0	0	0	50	5
Crabgrass, Large	55	5	10	0	55	85	0	65	0	0	10	20	10
Foxtail, Giant	60	0	0	0	40	55	0	80	0	0	15	20	20
Morningglory	10	5	0	0	20	20	0	10	0	0	15	10	5
Pigweed	80	15	0	20	75	100	5	55	0	0	60	10	25
Velvetleaf	40	10	5	0	30	35	0	20	0	0	5	25	0

Table A	Compounds							
250 g ai/ha	31	32	39	131	132	133	134	135
Preemergence								
Barnyardgrass	40	0	15	45	0	0	25	35
Crabgrass, Large	20	0	35	30	20	25	35	40
Foxtail, Giant	20	0	20	10	25	0	20	10
Morningglory	0	0	0	15	5	0	5	0
Pigweed	45	0	55	40	30	10	35	55
Velvetleaf	10	0	10	10	15	5	15	5

Table A	Compounds			
125 g ai/ha	38	51	110	311
Preemergence				
Barnyardgrass	0	60	10	0
Crabgrass, Large	0	80	15	0
Foxtail, Giant	0	70	0	0
Morningglory	5	10	10	0
Pigweed	0	100	10	0
Velvetleaf	0	20	10	0

TEST B

Seeds selected from barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.), Surinam grass (*Urochloa decumbens* (Staph) R. D. Webster, previously named *Brachiaria decumbens* Stapf), cocklebur (*Xanthium strumarium* L.), corn (*Zea mays* L.), large crabgrass (*Digitaria sanguinalis* (L.) Scop.), giant foxtail (*Setaria faberi* Herrm.), lambsquarters (*Chenopodium album* L.), morningglory (*Ipomoea coccinea* L.), pigweed (*Amaranthus retroflexus* L.), rice (*Oryza sativa* L.) and velvetleaf (*Abutilon theophrasti* Medik.) were planted and treated preemergence with test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant.

At the same time, plants selected from these crop and weed species and also blackgrass (*Alopecurus myosuroides* Huds.), wheat (*Triticum aestivum* L.) and wild oat (*Avena fatua* L.) were treated with postemergence applications of test chemicals formulated in the same manner. Plants ranged in height from 2 to 18 cm (1- to 4-leaf stage) for postemergence treatments. Plant species in the flooded paddy test consisted of rice (*Oryza sativa* L.), small flower umbrella sedge (*Cyperus difformis* L.), ducksalad (*Heteranthera limosa* (Sw.) Willd.) and barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.) grown to the 2-leaf stage for testing. Treated plants and controls were maintained in a greenhouse for 13 to 15 days, after which time all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table B, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table B	Compounds													
1000 g ai/ha	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Flooded Paddy														
Barnyardgrass	80	90	80	80	50	90	80	0	70	80	80	10	80	90
Ducksalad	90	90	80	90	80	90	90	0	80	90	70	80	90	90
Rice	80	70	80	70	40	80	70	20	80	80	90	50	70	80
Sedge, Umbrella	90	90	90	90	80	90	90	0	80	70	70	30	70	50

Table B	Compounds													
1000 g ai/ha	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Flooded Paddy														
Barnyardgrass	60	80	70	80	20	40	70	0	0	0	0	0	80	80
Ducksalad	90	90	90	90	70	90	90	0	0	0	0	0	90	80
Rice	60	90	80	80	0	70	60	0	0	0	0	0	80	80
Sedge, Umbrella	80	70	70	70	60	80	60	0	0	50	0	0	90	80

Table B	Compounds													
1000 g ai/ha	29	30	31	32	33	34	35	36	37	40	41	42	43	44
Flooded Paddy														
Barnyardgrass	90	60	80	0	90	80	90	70	30	0	50	0	80	70
Ducksalad	80	80	80	0	90	80	80	90	60	0	60	50	70	70
Rice	70	60	80	0	60	50	60	40	50	0	20	0	50	70
Sedge, Umbrella	80	70	50	20	90	80	90	60	90	30	70	50	70	70

Table B	Compounds													
1000 g ai/ha	45	46	47	48	49	50	51	52	54	55	56	57	58	59
Flooded Paddy														
Barnyardgrass	80	90	90	80	70	70	90	20	0	90	80	60	80	0
Ducksalad	80	90	80	80	80	70	80	20	0	80	80	50	80	0
Rice	70	70	70	80	30	60	70	0	0	70	70	60	60	0
Sedge, Umbrella	70	80	80	80	80	80	80	40	0	80	80	60	80	0

Table B	Compounds													
1000 g ai/ha	60	61	62	63	64	65	66	67	68	69	70	71	72	73
Flooded Paddy														
Barnyardgrass	60	30	70	80	30	80	10	60	0	0	10	0	0	30
Ducksalad	70	80	80	90	90	90	0	80	0	0	0	0	0	10
Rice	50	0	30	60	50	50	0	60	0	0	10	0	0	50
Sedge, Umbrella	60	60	80	100	90	90	10	80	0	0	30	0	0	80

Table B	Compounds													
1000 g ai/ha	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Flooded Paddy														
Barnyardgrass	0	80	70	40	30	60	80	50	30	10	10	40	30	20
Ducksalad	0	90	100	40	30	80	90	80	20	30	20	20	20	20
Rice	0	90	60	70	40	70	60	60	40	10	0	40	50	10
Sedge, Umbrella	70	70	60	80	80	90	80	80	40	50	70	60	70	80

Table B	Compounds													
1000 g ai/ha	88	89	90	91	92	93	94	95	96	97	98	99	100	101
Flooded Paddy														
Barnyardgrass	70	10	10	0	0	0	20	50	80	0	0	0	0	70
Ducksalad	80	0	30	30	0	10	30	80	90	50	0	0	0	90
Rice	40	10	10	10	0	20	10	60	70	0	0	0	0	80
Sedge, Umbrella	80	60	50	60	0	70	50	80	90	70	0	40	0	80

Table B	Compounds													
1000 g ai/ha	102	104	105	106	107	108	109	110	112	113	114	115	117	118
Flooded Paddy														
Barnyardgrass	80	0	20	0	0	80	80	30	50	70	70	90	70	50
Ducksalad	90	60	70	80	60	90	90	0	80	90	80	90	80	80
Rice	50	0	0	0	0	70	70	20	70	60	50	60	50	80
Sedge, Umbrella	100	70	70	90	60	90	60	20	80	90	90	90	90	80

Table B	Compounds													
1000 g ai/ha	119	120	121	122	123	124	125	126	127	128	129	130	131	132
Flooded Paddy														
Barnyardgrass	0	30	0	60	0	0	0	10	50	70	30	40	70	30
Ducksalad	0	70	0	80	50	70	0	80	90	90	70	10	80	10
Rice	0	0	0	70	0	0	0	20	50	60	10	0	60	0
Sedge, Umbrella	0	10	0	80	30	0	0	80	100	90	80	0	80	40

Table B	Compounds													
1000 g ai/ha	133	134	135	136	137	138	139	140	141	142	143	144	145	146
Flooded Paddy														
Barnyardgrass	20	60	60	60	20	10	70	70	10	90	0	80	70	60
Ducksalad	50	90	80	90	30	80	80	80	80	90	0	90	70	80
Rice	0	60	60	30	20	50	50	30	0	70	0	70	40	40
Sedge, Umbrella	40	80	70	90	90	80	80	80	90	80	0	90	90	90

Table B	Compounds													
1000 g ai/ha	147	148	149	150	151	152	153	154	155	156	157	158	159	160
Flooded Paddy														
Barnyardgrass	60	20	70	70	0	80	40	50	70	100	20	70	80	70
Ducksalad	80	0	90	30	0	80	80	80	100	100	0	90	90	90
Rice	50	0	50	40	0	70	60	20	20	90	30	60	60	90
Sedge, Umbrella	90	70	60	50	60	90	70	20	90	90	40	80	70	80

Table B	Compounds													
1000 g ai/ha	161	162	163	164	165	166	167	168	169	170	171	179	180	181
Flooded Paddy														
Barnyardgrass	80	50	70	0	0	0	0	50	0	10	0	0	20	80
Ducksalad	80	80	80	0	0	0	0	70	0	0	0	0	20	90
Rice	40	80	60	0	0	0	0	40	0	20	0	0	0	80
Sedge, Umbrella	60	80	70	0	0	30	0	90	0	20	0	0	0	80

Table B	Compounds													
1000 g ai/ha	182	183	184	185	186	187	188	189	190	191	192	193	194	195
Flooded Paddy														
Barnyardgrass	40	60	0	0	30	60	60	60	20	20	90	80	50	60
Ducksalad	60	70	0	0	90	90	80	70	60	20	80	90	90	40
Rice	0	0	0	0	30	30	70	40	0	0	70	80	60	30
Sedge, Umbrella	80	80	30	60	90	80	80	70	60	90	80	80	80	50

Table B	Compounds													
1000 g ai/ha	196	197	198	199	200	201	202	203	204	205	206	207	209	210
Flooded Paddy														
Barnyardgrass	20	0	20	10	0	0	40	0	20	70	10	80	60	80
Ducksalad	30	0	70	0	0	0	60	0	40	50	40	90	80	80
Rice	0	0	20	20	0	0	30	0	30	60	30	60	50	70
Sedge, Umbrella	30	0	70	10	50	0	50	0	80	60	50	80	90	80

Table B	Compounds													
1000 g ai/ha	211	212	213	214	215	216	217	218	219	220	221	222	223	224
Flooded Paddy														
Barnyardgrass	20	50	60	0	30	20	0	0	0	0	40	90	40	90
Ducksalad	80	80	70	30	90	80	0	0	80	40	50	80	90	80
Rice	20	70	40	0	30	30	0	0	0	0	20	90	70	90
Sedge, Umbrella	30	70	80	50	90	90	0	20	80	60	80	70	80	80

Table B	Compounds													
1000 g ai/ha	225	226	227	228	229	230	231	232	233	234	235	236	237	238
Flooded Paddy														
Barnyardgrass	90	80	70	90	90	50	80	40	0	0	40	80	60	10
Ducksalad	90	70	80	90	90	60	90	80	50	0	90	90	80	0
Rice	90	80	70	90	90	60	80	50	30	0	40	70	50	30
Sedge, Umbrella	90	80	50	80	80	70	90	90	80	0	80	80	40	80

Table B	Compounds													
1000 g ai/ha	239	240	241	242	243	244	245	246	247	248	249	250	251	252
Flooded Paddy														
Barnyardgrass	0	0	80	90	90	90	90	50	70	40	0	0	0	70
Ducksalad	0	0	70	90	90	90	80	50	80	30	0	40	30	90
Rice	30	0	70	90	90	90	80	60	80	50	0	50	40	80
Sedge, Umbrella	70	60	80	90	80	80	50	50	70	50	30	70	40	80

Table B	Compounds													
1000 g ai/ha	253	254	255	256	257	258	259	260	261	262	263	264	265	266
Flooded Paddy														
Barnyardgrass	0	30	70	30	0	70	30	60	0	0	60	0	0	80
Ducksalad	60	90	80	90	50	90	90	90	80	0	90	90	0	90
Rice	50	80	70	50	30	80	70	70	60	0	70	0	0	80
Sedge, Umbrella	20	60	80	70	0	70	70	70	30	0	80	50	0	80

Table B	Compounds													
1000 g ai/ha	267	268	269	270	271	272	273	274	275	276	277	278	279	280
Flooded Paddy														
Barnyardgrass	60	90	90	50	0	50	60	70	20	70	0	60	10	0
Ducksalad	0	90	80	70	40	80	90	70	60	80	0	80	60	20
Rice	70	90	80	70	20	40	40	60	20	70	0	60	40	0
Sedge, Umbrella	70	80	80	60	40	80	80	80	80	80	0	70	60	30

Table B	Compounds													
1000 g ai/ha	281	282	283	284	285	286	287	288	289	290	291	292	293	294
Flooded Paddy														
Barnyardgrass	70	20	20	30	90	90	80	0	0	70	0	20	90	90
Ducksalad	80	80	70	70	90	90	80	0	0	70	0	0	80	90
Rice	70	20	10	10	80	70	70	0	0	60	0	30	90	90
Sedge, Umbrella	70	0	80	0	90	80	80	60	0	70	0	60	80	80

Table B	Compounds													
1000 g ai/ha	295	296	297	298	299	300	301	302	303	304	305	306	307	308
Flooded Paddy														
Barnyardgrass	60	80	30	90	90	90	90	70	90	80	90	80	90	90
Ducksalad	70	80	30	90	90	90	90	90	90	90	80	80	80	90
Rice	50	60	20	80	90	90	90	70	90	90	70	60	90	70
Sedge, Umbrella	80	80	80	70	90	90	90	80	90	90	90	80	90	90

Table B 1000 g ai/ha	Compounds 309	310	311	312	313	314	315	316	317	318	319	329	330	331
Flooded Paddy														
Barnyardgrass	90	90	50	0	70	30	0	0	0	70	10	0	0	80
Ducksalad	90	90	60	0	80	0	0	0	0	70	90	0	0	90
Rice	80	80	60	0	80	0	0	0	0	40	70	0	0	60
Sedge, Umbrella	80	80	30	0	80	60	0	0	0	80	80	0	0	90

Table B 1000 g ai/ha	Compounds 332	333	334	335	336	338	340	341	342	343	344	345	346	347
Flooded Paddy														
Barnyardgrass	60	50	90	60	90	40	90	90	90	90	60	30	40	0
Ducksalad	90	80	90	90	90	60	90	90	80	90	80	70	60	0
Rice	50	20	80	70	80	30	80	70	70	80	70	40	40	0
Sedge, Umbrella	90	80	80	80	80	80	80	80	70	90	80	80	80	0

Table B 1000 g ai/ha	Compounds 348	349	350	351	352	353	354	355	356	357	358	359	360	361
Flooded Paddy														
Barnyardgrass	0	80	0	0	90	70	40	50	50	70	80	70	40	80
Ducksalad	0	90	0	0	90	80	50	70	60	80	90	70	70	90
Rice	0	70	0	0	70	40	50	50	50	70	70	70	50	90
Sedge, Umbrella	0	80	0	0	80	90	50	70	70	80	80	80	90	90

Table B 1000 g ai/ha	Compounds 362	363	364	365	366
Flooded Paddy					
Barnyardgrass	50	60	90	90	80
Ducksalad	90	90	100	90	100
Rice	60	60	90	90	70
Sedge, Umbrella	90	80	100	90	90

Table B 500 g ai/ha	Compounds 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Postemergence														
Barnyardgrass	30	70	20	30	20	80	0	0	40	10	0	0	10	20
Blackgrass	40	30	20	10	0	90	0	0	50	50	40	30	30	60
Cocklebur	90	80	70	70	70	80	0	0	70	80	10	-	50	20
Corn	20	20	20	20	20	60	10	0	10	0	0	0	0	0
Crabgrass, Large	0	30	10	30	20	30	0	0	20	20	10	0	30	30
Foxtail, Giant	30	30	20	30	30	20	0	0	30	20	30	30	30	40

Lambsquarters	80	90	60	100	80	100	20	10	80	90	70	70	70	70
Morningglory	60	70	50	50	20	0	0	0	0	20	10	10	10	20
Oat, Wild	50	30	20	20	20	70	0	0	50	30	20	10	30	40
Pigweed	70	70	40	80	60	70	0	10	80	90	20	30	70	60
Surinam Grass	20	50	10	30	20	60	0	0	0	30	10	20	20	20
Velvetleaf	80	50	10	20	20	60	0	0	70	70	20	20	50	50
Wheat	10	20	10	10	10	40	0	0	20	20	10	10	10	20

Table B	Compounds													
500 g ai/ha	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Postemergence														
Barnyardgrass	10	60	10	10	0	10	0	0	0	0	0	10	60	40
Blackgrass	20	70	50	30	40	40	30	30	30	30	40	0	80	30
Cocklebur	20	20	70	20	50	50	-	-	10	40	0	0	50	80
Corn	0	30	30	20	20	20	0	0	20	0	0	10	40	20
Crabgrass, Large	10	10	10	10	10	10	10	10	0	10	0	10	80	30
Foxtail, Giant	40	30	40	30	20	20	20	20	0	20	0	10	100	50
Lambsquarters	70	70	90	50	50	40	40	60	20	10	0	10	100	90
Morningglory	0	20	10	20	10	40	20	30	30	20	20	0	50	40
Oat, Wild	30	40	30	30	30	40	30	10	20	30	30	0	60	30
Pigweed	30	60	60	40	60	60	30	20	20	30	10	50	100	100
Surinam Grass	10	20	20	10	20	10	10	0	10	20	0	10	80	30
Velvetleaf	30	60	60	20	10	30	20	30	0	10	0	0	70	60
Wheat	10	20	30	20	10	20	20	0	0	20	10	0	20	20

Table B	Compounds													
500 g ai/ha	29	30	31	32	33	34	35	36	37	40	41	42	43	44
Postemergence														
Barnyardgrass	50	10	50	10	30	30	20	20	20	10	20	30	70	60
Blackgrass	20	30	50	0	20	20	30	20	10	20	20	10	20	20
Cocklebur	60	70	90	20	100	90	100	50	80	50	40	20	90	80
Corn	20	20	30	10	-	-	-	-	-	-	-	20	30	30
Crabgrass, Large	70	10	30	10	30	20	20	20	20	20	30	70	90	90
Foxtail, Giant	40	20	30	10	30	30	20	30	20	20	20	10	50	30
Lambsquarters	100	90	90	90	90	90	90	90	90	70	70	70	90	90
Morningglory	70	60	70	0	-	-	-	-	-	-	-	50	100	90
Oat, Wild	40	30	30	20	10	10	10	20	20	10	10	20	30	20
Pigweed	100	100	90	50	90	90	100	90	90	60	70	70	100	100
Surinam Grass	30	40	60	10	30	50	40	10	20	20	20	20	80	20

Velvetleaf	70	50	50	30	60	50	50	40	40	20	30	60	90	80
Wheat	10	10	10	10	30	30	20	30	20	30	10	20	30	20

Table B	Compounds													
500 g ai/ha	45	46	47	48	50	51	52	55	56	57	58	59	60	61
Postemergence														
Barnyardgrass	30	50	40	60	70	80	0	10	20	30	60	20	10	30
Blackgrass	20	20	10	10	30	0	0	10	10	10	30	0	0	0
Cocklebur	80	90	100	70	90	80	40	40	80	60	100	40	70	100
Corn	30	30	30	30	40	0	40	30	30	30	20	20	20	40
Crabgrass, Large	30	90	70	20	30	50	10	10	30	20	30	20	20	30
Foxtail, Giant	30	40	30	30	30	0	10	10	20	30	20	20	20	30
Lambsquarters	90	90	90	90	90	90	80	70	90	90	90	90	90	100
Morningglory	90	90	100	50	70	0	0	10	30	10	30	20	20	50
Oat, Wild	20	10	30	30	30	10	10	30	20	30	30	30	20	20
Pigweed	100	90	100	70	100	100	10	40	90	80	90	80	70	60
Surinam Grass	30	40	40	50	40	20	0	10	30	20	30	20	20	30
Velvetleaf	70	80	70	80	60	70	20	40	50	30	70	30	60	70
Wheat	30	30	30	20	30	30	0	10	20	10	20	10	0	10

Table B	Compounds													
500 g ai/ha	62	63	64	65	66	67	68	69	70	71	75	76	77	78
Postemergence														
Barnyardgrass	50	20	10	10	10	10	0	0	20	10	20	20	0	30
Blackgrass	70	20	10	10	30	10	20	30	20	0	30	50	30	30
Cocklebur	100	70	50	80	30	70	10	0	100	0	30	90	0	100
Corn	20	20	20	20	20	10	0	0	30	10	20	30	10	–
Crabgrass, Large	20	20	10	20	10	10	0	0	20	10	10	20	40	30
Foxtail, Giant	30	20	10	20	20	10	0	0	30	10	20	40	40	30
Lambsquarters	90	80	70	70	70	60	10	10	80	20	40	60	90	80
Morningglory	60	20	20	20	20	10	0	0	30	0	50	10	70	–
Oat, Wild	30	30	30	20	10	30	20	20	20	0	40	40	40	20
Pigweed	90	70	50	60	30	20	30	20	50	20	70	100	90	90
Surinam Grass	70	20	10	30	10	10	0	0	20	10	20	20	20	20
Velvetleaf	70	50	10	10	10	10	0	0	60	0	20	40	30	80
Wheat	10	10	10	10	10	10	0	0	20	0	20	30	20	30

Table B	Compounds													
500 g ai/ha	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Postemergence														
Barnyardgrass	40	90	90	20	50	40	80	80	0	60	20	30	0	0
Blackgrass	30	40	20	10	0	10	20	20	0	0	10	10	0	0
Cocklebur	80	100	90	100	20	100	100	100	0	50	90	60	10	0
Corn	-	50	30	30	30	20	30	30	0	70	20	10	10	10
Crabgrass, Large	30	100	20	20	30	50	80	90	60	60	20	10	10	10
Foxtail, Giant	40	90	50	10	10	10	50	60	0	40	20	10	0	0
Lambsquarters	80	80	50	50	60	60	60	90	0	100	60	50	30	20
Morningglory	-	100	30	70	30	60	100	100	0	0	50	40	0	0
Oat, Wild	30	50	30	30	20	20	50	60	0	0	30	30	10	0
Pigweed	100	100	90	100	100	100	100	100	0	60	40	40	10	10
Surinam Grass	40	90	60	60	40	60	70	100	0	0	20	10	10	10
Velvetleaf	80	100	90	90	70	100	80	70	0	70	50	30	10	0
Wheat	40	30	40	20	30	30	60	40	0	0	20	10	10	0

Table B	Compounds													
500 g ai/ha	93	94	95	96	97	98	99	100	101	102	104	105	106	107
Postemergence														
Barnyardgrass	10	10	20	50	0	10	0	0	20	40	0	0	0	0
Blackgrass	10	10	0	20	0	0	40	30	40	20	0	0	0	0
Cocklebur	50	50	70	100	70	20	30	0	80	50	0	30	50	0
Corn	20	20	10	20	0	10	20	0	40	40	0	0	10	0
Crabgrass, Large	10	10	50	50	0	20	10	0	20	70	0	0	10	0
Foxtail, Giant	10	10	30	50	0	10	30	0	30	30	0	0	0	0
Lambsquarters	90	80	100	100	70	30	90	50	90	20	20	80	90	20
Morningglory	40	10	60	0	0	20	20	0	10	30	0	10	10	0
Oat, Wild	10	10	20	30	0	10	40	40	50	40	0	10	20	0
Pigweed	30	30	100	100	0	30	70	60	90	100	10	80	20	10
Surinam Grass	10	10	20	30	0	20	10	20	20	100	10	10	10	10
Velvetleaf	10	20	60	80	60	10	40	0	30	20	0	0	20	0
Wheat	10	10	10	20	0	0	20	10	20	20	0	0	0	0

Table B	Compounds													
500 g ai/ha	108	109	110	112	113	114	115	117	118	119	120	121	122	123
Postemergence														
Barnyardgrass	70	20	20	70	80	30	50	30	30	10	10	0	20	0
Blackgrass	20	20	0	20	20	30	20	10	10	10	10	0	10	0

Cocklebur	90	70	40	100	100	90	90	90	90	60	60	20	90	0
Corn	30	20	20	40	30	-	-	-	40	30	-	10	10	0
Crabgrass, Large	70	10	20	30	80	40	30	30	30	20	20	10	10	0
Foxtail, Giant	30	20	10	30	40	30	30	20	30	10	10	10	20	0
Lambsquarters	100	20	60	100	100	90	100	90	20	60	50	80	0	0
Morningglory	100	10	30	30	100	-	-	-	70	40	-	0	0	0
Oat, Wild	50	30	0	40	60	10	30	20	20	20	10	30	40	0
Pigweed	100	70	50	100	100	100	100	90	100	30	70	50	10	0
Surinam Grass	10	20	30	20	60	20	60	40	40	10	50	30	10	0
Velvetleaf	70	20	40	70	60	60	80	50	40	50	30	20	20	0
Wheat	20	20	30	30	30	20	30	20	10	0	10	0	10	0

Table B	Compounds													
500 g ai/ha	124	135	126	127	128	129	130	131	132	133	134	135	136	137
Postemergence														
Barnyardgrass	0	0	30	20	30	0	80	50	60	40	40	40	90	40
Blackgrass	0	0	0	10	10	0	60	20	40	10	20	0	60	20
Cocklebur	10	0	100	80	100	60	100	100	90	60	100	90	100	100
Corn	10	0	20	-	-	-	40	30	20	20	30	30	30	20
Crabgrass, Large	10	0	40	30	20	10	90	30	40	30	30	30	70	30
Foxtail, Giant	10	0	30	30	20	10	60	30	40	20	40	40	10	20
Lambsquarters	70	20	60	80	60	10	100	90	100	70	90	80	100	80
Morningglory	10	0	30	-	-	-	100	60	70	20	40	50	100	60
Oat, Wild	10	0	50	10	10	0	60	20	20	20	30	20	60	70
Pigweed	70	0	40	60	60	10	100	60	90	50	90	90	90	100
Surinam Grass	20	10	20	10	20	20	90	60	60	50	40	40	70	70
Velvetleaf	10	0	40	10	60	20	70	40	60	50	40	30	70	60
Wheat	0	0	0	10	20	0	40	20	20	0	20	30	40	30

Table B	Compounds													
500 g ai/ha	138	139	140	141	142	143	144	145	146	147	148	149	150	151
Postemergence														
Barnyardgrass	20	10	0	10	10	0	80	40	60	30	20	30	50	10
Blackgrass	20	10	0	20	40	0	60	10	20	20	0	40	10	30
Cocklebur	90	100	20	20	40	0	100	30	80	80	70	100	80	0
Corn	30	20	10	10	0	10	30	20	30	30	10	30	50	10
Crabgrass, Large	20	20	0	30	10	0	100	10	20	70	10	30	10	0
Foxtail, Giant	30	20	0	20	30	0	90	40	20	40	10	10	10	20
Lambsquarters	90	90	80	90	80	20	90	70	90	90	10	60	70	50

Morningglory	60	100	0	30	50	0	80	20	20	30	10	40	40	30
Oat, Wild	30	10	0	20	20	20	50	30	20	30	10	30	20	30
Pigweed	90	90	0	80	60	20	100	100	90	90	20	70	90	30
Surinam Grass	30	20	0	20	20	10	90	20	30	30	10	20	40	10
Velvetleaf	50	60	0	80	60	20	100	60	60	60	10	50	60	20
Wheat	30	10	0	20	10	0	30	20	10	20	30	10	10	20

Table B	Compounds													
500 g ai/ha	153	154	155	156	157	158	159	160	161	162	163	164	165	166
Postemergence														
Barnyardgrass	30	50	20	40	20	0	0	10	10	30	0	0	0	0
Blackgrass	10	10	50	60	20	30	-	50	40	50	50	0	0	0
Cocklebur	100	70	80	80	90	70	80	90	30	60	60	0	0	0
Corn	20	20	20	10	0	10	0	0	0	0	0	10	0	0
Crabgrass, Large	20	20	40	10	20	30	0	0	10	40	40	0	0	0
Foxtail, Giant	20	20	30	40	40	30	50	30	30	30	40	0	0	0
Lambsquarters	80	90	90	80	70	80	90	80	70	90	80	10	0	0
Morningglory	70	70	60	50	30	50	10	70	20	60	0	0	0	0
Oat, Wild	50	30	50	40	40	40	-	30	40	40	30	0	0	0
Pigweed	70	80	100	60	80	70	80	80	60	80	80	0	0	0
Surinam Grass	30	60	30	20	20	0	20	10	20	40	40	10	0	0
Velvetleaf	60	60	70	90	80	50	70	70	50	80	80	0	0	0
Wheat	10	10	20	20	20	10	-	10	10	10	10	0	0	0

Table B	Compounds													
500 g ai/ha	167	169	170	171	179	180	181	182	183	184	185	186	187	188
Postemergence														
Barnyardgrass	0	10	10	10	0	0	10	50	0	0	50	50	10	20
Blackgrass	0	10	0	0	0	0	10	0	10	0	0	30	0	10
Cocklebur	0	0	0	0	0	0	70	60	90	60	50	90	70	90
Corn	0	10	10	10	0	0	20	30	20	30	30	20	20	20
Crabgrass, Large	0	10	10	10	0	0	20	30	30	30	40	10	10	10
Foxtail, Giant	0	0	10	20	0	0	20	20	30	40	30	20	10	10
Lambsquarters	0	60	70	20	0	0	90	70	80	70	70	30	0	70
Morningglory	0	70	80	0	0	0	20	70	70	60	70	30	20	60
Oat, Wild	0	10	10	0	0	0	30	30	20	30	30	20	20	20
Pigweed	0	40	50	20	0	0	90	70	80	60	80	60	20	70
Surinam Grass	0	10	10	10	0	0	20	20	20	20	30	30	10	10
Velvetleaf	0	0	20	0	0	0	20	60	60	60	50	60	10	20

Wheat	0	0	0	0	0	0	0	10	0	0	10	20	0	10

Table B	Compounds													
500 g ai/ha	189	190	193	194	195	196	197	198	199	200	201	202	203	204
Postemergence														
Barnyardgrass	10	10	10	10	90	30	10	30	10	10	0	0	0	10
Blackgrass	0	0	20	0	10	0	0	10	10	10	0	0	0	20
Cocklebur	10	10	70	10	60	20	10	90	60	20	10	40	10	90
Corn	10	10	20	0	30	10	20	70	20	30	20	10	10	20
Crabgrass, Large	20	20	10	10	50	30	0	20	10	10	10	10	10	10
Foxtail, Giant	10	10	20	0	20	0	0	30	10	10	0	10	10	20
Lambsquarters	50	80	90	30	60	30	0	70	70	60	40	50	50	50
Morningglory	90	90	70	10	60	0	0	80	60	40	30	40	30	40
Oat, Wild	10	20	0	0	20	0	30	30	10	10	10	10	10	20
Pigweed	60	70	60	30	80	30	10	50	40	40	40	40	10	70
Surinam Grass	30	20	10	10	30	40	20	20	20	20	10	10	20	50
Velvetleaf	20	40	70	10	40	0	20	20	30	30	0	30	10	70
Wheat	0	0	10	0	20	0	10	10	10	0	0	0	0	30

Table B	Compounds													
500 g ai/ha	205	206	207	209	210	211	212	213	214	215	216	217	218	219
Postemergence														
Barnyardgrass	20	10	20	20	40	10	20	50	0	20	10	0	0	0
Blackgrass	20	20	10	20	30	10	20	40	0	0	0	0	0	0
Cocklebur	80	40	80	40	90	60	90	70	0	80	70	0	0	20
Corn	20	20	20	30	60	10	40	20	20	10	10	0	10	10
Crabgrass, Large	20	30	20	20	20	10	10	30	0	0	0	0	10	10
Foxtail, Giant	30	30	20	30	30	10	40	30	20	20	20	0	0	10
Lambsquarters	70	80	80	40	80	70	100	40	0	0	0	0	10	10
Morningglory	50	20	20	20	70	30	50	30	0	40	0	10	10	60
Oat, Wild	30	20	30	20	20	10	20	20	0	30	0	0	0	0
Pigweed	50	40	60	40	70	30	90	20	0	70	20	0	30	20
Surinam Grass	20	20	20	20	30	10	60	20	10	10	20	10	10	10
Velvetleaf	40	20	30	20	70	30	70	60	10	60	60	10	0	10
Wheat	20	20	20	30	20	10	20	30	0	20	10	0	0	0

Table B	Compounds													
500 g ai/ha	220	221	222	223	224	225	226	227	228	229	230	231	232	233
Postemergence														
Barnyardgrass	0	10	20	20	30	30	20	-	70	50	20	40	-	-

Blackgrass	0	0	20	0	10	40	20	30	40	30	30	30	0	10
Cocklebur	10	20	60	30	40	20	20	30	80	70	10	40	30	20
Corn	10	10	20	20	20	20	40	40	30	20	20	20	20	30
Crabgrass, Large	10	10	20	20	20	30	20	30	40	20	20	20	20	10
Foxtail, Giant	10	10	30	20	30	20	20	60	50	50	20	30	30	30
Lambsquarters	20	20	70	80	70	70	60	70	80	80	60	70	60	70
Morningglory	0	0	80	80	70	40	80	60	80	70	70	70	70	80
Oat, Wild	10	10	20	30	30	30	30	0	50	50	40	40	0	20
Pigweed	10	20	60	70	60	70	60	–	80	80	60	70	40	70
Surinam Grass	10	10	30	10	20	20	20	30	40	20	10	30	20	20
Velvetleaf	0	0	60	20	60	40	20	70	80	70	30	50	40	50
Wheat	0	10	20	0	30	30	30	10	40	40	20	40	0	10

Table B	Compounds													
500 g ai/ha	234	235	236	237	238	239	240	241	242	343	244	245	246	247
Postemergence														
Barnyardgrass	–	–	–	–	0	0	0	0	60	20	50	70	70	10
Blackgrass	0	20	10	10	10	0	10	10	20	0	20	0	0	0
Cocklebur	20	30	40	40	20	20	20	30	90	30	80	80	30	30
Corn	20	40	40	40	0	20	10	10	40	10	30	30	10	20
Crabgrass, Large	20	20	20	20	0	20	20	10	50	10	30	50	20	10
Foxtail, Giant	30	30	40	20	0	0	0	0	30	20	30	60	30	20
Lambsquarters	40	50	70	70	0	30	50	50	90	80	70	90	70	70
Morningglory	70	70	60	60	0	10	30	70	40	20	20	60	10	30
Oat, Wild	20	20	20	20	10	0	0	20	30	20	50	30	20	10
Pigweed	30	40	70	60	0	50	50	50	80	60	70	80	60	60
Surinam Grass	10	10	20	20	0	30	20	20	60	20	30	60	20	20
Velvetleaf	30	30	50	50	10	10	10	10	60	60	60	80	60	70
Wheat	10	20	20	20	20	0	20	10	10	0	20	20	30	0

Table B	Compounds													
500 g ai/ha	248	249	250	252	253	254	356	257	358	259	260	261	262	263
Postemergence														
Barnyardgrass	40	20	20	10	10	10	60	0	0	0	0	0	10	10
Blackgrass	30	30	40	20	20	10	20	10	10	20	10	20	20	20
Cocklebur	50	30	40	40	20	20	0	70	30	20	20	10	10	10
Corn	30	20	30	10	0	10	10	0	10	20	0	20	20	10
Crabgrass, Large	20	30	30	10	0	10	20	10	0	20	10	10	20	20
Foxtail, Giant	30	30	30	30	0	0	50	0	0	0	0	0	20	20

Lambsquarters	70	20	40	30	30	20	60	50	70	30	30	60	80	80
Morningglory	50	30	30	20	30	30	10	0	10	0	10	0	0	20
Oat, Wild	60	40	40	20	30	20	30	30	30	20	30	20	0	20
Pigweed	80	80	70	30	30	30	60	80	60	90	70	70	80	90
Surinam Grass	20	30	20	20	0	10	20	20	10	20	20	20	20	10
Velvetleaf	30	20	30	30	10	10	30	10	0	0	20	0	20	20
Wheat	40	30	40	20	30	20	30	20	20	20	40	20	10	20

Table B							Compounds							
500 g ai/ha	264	265	266	267	268	269	270	271	272	273	274	275	276	277
Postemergence														
Barnyardgrass	0	0	0	90	30	30	0	0	80	70	10	20	10	0
Blackgrass	20	10	20	40	50	50	20	20	100	70	30	40	40	20
Cocklebur	0	0	0	90	50	50	0	0	90	80	10	10	10	0
Corn	0	10	0	40	30	30	10	20	40	20	20	0	20	10
Crabgrass, Large	0	0	0	40	20	20	0	0	70	50	0	10	20	0
Foxtail, Giant	0	0	20	50	20	30	0	0	30	20	50	0	40	0
Lambsquarters	0	0	100	50	70	70	10	60	100	90	70	70	60	30
Morningglory	0	10	50	40	20	40	10	0	100	70	60	10	30	20
Oat, Wild	20	10	20	40	50	30	0	30	90	50	40	40	40	20
Pigweed	0	20	100	90	50	60	0	80	100	90	60	70	70	10
Surinam Grass	0	0	20	50	50	20	10	0	60	40	30	30	20	0
Velvetleaf	0	10	0	70	60	20	0	0	100	70	10	30	40	20
Wheat	10	10	30	30	30	30	0	30	30	40	20	30	30	20

Table B							Compounds							
500 g ai/ha	278	279	280	281	282	283	284	285	286	287	288	289	290	291
Postemergence														
Barnyardgrass	10	10	0	0	20	0	0	10	0	20	0	0	0	30
Blackgrass	30	30	20	30	30	40	40	30	20	30	20	10	30	10
Cocklebur	30	20	30	20	20	0	0	30	20	10	0	0	10	10
Corn	20	10	10	10	20	10	10	10	10	70	0	0	10	60
Crabgrass, Large	10	10	0	10	10	10	10	20	10	0	0	0	0	30
Foxtail, Giant	10	0	0	10	20	0	0	50	50	80	30	60	60	80
Lambsquarters	30	20	20	30	60	30	50	70	70	20	30	30	20	60
Morningglory	20	20	10	10	20	30	0	30	0	20	0	0	0	40
Oat, Wild	30	20	20	20	20	10	30	50	40	40	40	30	40	20
Pigweed	40	30	20	30	60	20	70	80	100	30	20	20	10	30
Surinam Grass	10	10	10	20	10	10	20	30	20	10	0	0	30	60

Velvetleaf	10	10	20	20	20	0	0	40	60	60	20	10	10	60
Wheat	30	30	30	30	30	20	30	40	30	30	30	20	30	0

Table B	Compounds													
500 g ai/ha	292	293	294	295	296	297	298	299	300	301	302	303	304	305
Postemergence														
Barnyardgrass	0	10	60	50	80	20	50	90	50	60	40	40	20	0
Blackgrass	20	30	60	40	40	20	50	50	30	40	20	40	40	30
Cocklebur	10	30	30	90	60	0	50	70	50	50	10	30	100	10
Corn	20	30	50	20	70	100	10	20	30	50	50	70	80	70
Crabgrass, Large	10	20	20	60	60	30	70	90	30	60	10	60	10	0
Foxtail, Giant	20	30	50	70	60	30	50	80	30	20	20	50	30	20
Lambsquarters	70	70	80	60	70	20	90	100	80	80	70	90	90	80
Morningglory	20	70	20	100	80	30	70	80	90	90	60	90	100	0
Oat, Wild	40	50	50	50	40	20	40	40	30	40	10	40	40	30
Pigweed	30	40	70	100	100	40	90	100	90	90	90	90	90	70
Surinam Grass	20	20	40	60	50	30	50	80	10	30	10	20	10	20
Velvetleaf	10	30	80	100	100	10	60	100	70	100	10	70	60	20
Wheat	20	30	40	30	30	10	30	30	20	20	10	20	20	10

Table B	Compounds													
500 g ai/ha	306	307	308	309	310	311	312	313	314	315	316	317	318	319
Postemergence														
Barnyardgrass	10	10	10	40	20	0	0	50	30	20	40	0	70	30
Blackgrass	30	30	30	30	30	0	0	10	20	0	0	0	10	0
Cocklebur	70	30	40	70	20	0	0	90	30	20	20	0	80	40
Corn	30	10	10	60	20	0	0	20	20	20	20	0	20	20
Crabgrass, Large	50	30	10	40	30	0	0	20	20	10	10	0	60	20
Foxtail, Giant	40	30	20	40	40	0	0	50	20	10	20	0	10	30
Lambsquarters	80	80	60	80	80	0	20	90	60	60	70	50	80	60
Morningglory	70	0	20	40	50	0	20	80	80	20	10	0	80	20
Oat, Wild	30	20	20	40	40	0	0	30	30	10	20	0	30	20
Pigweed	100	60	70	70	70	0	20	70	70	50	50	0	100	40
Surinam Grass	30	30	20	40	20	0	0	20	20	20	10	0	20	20
Velvetleaf	60	60	20	40	50	0	0	70	30	20	40	0	80	20
Wheat	20	20	20	30	20	0	0	10	10	0	0	0	10	30

Table B 500 g ai/ha Postemergence	Compounds 329	330	331	332	333	334	335	336	338	340	341	342	343	344
Barnyardgrass	10	0	20	60	40	60	50	30	40	20	30	20	50	10
Blackgrass	20	0	30	80	70	70	30	20	40	30	20	30	10	0
Cocklebur	30	0	30	70	80	70	70	50	10	20	20	20	20	10
Corn	20	0	0	10	10	20	20	20	20	20	10	30	30	10
Crabgrass, Large	10	0	10	80	100	50	40	50	60	20	20	20	50	10
Foxtail, Giant	30	0	30	50	40	60	40	40	30	40	30	50	50	10
Lambsquarters	70	10	70	100	100	90	30	90	50	70	100	100	100	40
Morningglory	20	10	10	70	60	80	40	70	100	40	40	80	80	50
Oat, Wild	30	20	30	60	60	30	40	20	40	30	30	30	10	0
Pigweed	80	0	50	100	100	70	70	70	80	80	60	80	90	50
Surinam Grass	20	0	20	40	30	50	30	20	40	20	20	20	40	10
Velvetleaf	30	10	20	90	60	60	60	30	50	40	30	50	50	30
Wheat	30	0	20	30	30	30	20	10	10	10	20	10	0	10

Table B 500 g ai/ha Postemergence	Compounds 345	347	348	349	350	351	352	353	354	355	356	357	358	359
Barnyardgrass	0	0	0	10	0	0	10	10	0	10	0	10	20	10
Blackgrass	0	30	40	80	0	0	30	40	20	20	10	30	40	50
Cocklebur	0	0	0	20	30	0	10	20	20	10	0	20	20	30
Corn	0	0	0	10	20	10	10	30	0	0	0	20	0	10
Crabgrass, Large	0	0	0	20	10	10	30	10	10	10	30	10	10	20
Foxtail, Giant	0	0	0	30	30	0	30	30	20	30	30	40	30	20
Lambsquarters	20	10	0	80	10	10	60	40	50	70	50	60	50	50
Morningglory	10	10	0	50	-	0	60	-	60	40	10	30	50	10
Oat, Wild	10	20	30	40	0	0	20	40	20	30	20	30	30	30
Pigweed	20	10	0	70	60	50	60	70	50	50	70	40	40	50
Surinam Grass	0	0	0	30	10	0	40	10	20	30	20	20	10	10
Velvetleaf	10	0	0	40	10	0	60	20	10	50	0	20	20	20
Wheat	0	0	20	10	0	0	20	10	20	20	10	0	10	20

Table B 500 g ai/ha Postemergence	Compounds 360	361	362	363	364	365	366
Barnyardgrass	30	10	0	0	70	10	10
Blackgrass	50	40	20	70	80	90	50

Cocklebur	20	20	30	30	50	60	50
Corn	20	0	0	0	40	20	20
Crabgrass, Large	20	10	0	10	70	80	20
Foxtail, Giant	50	30	10	10	50	70	40
Lambsquarters	20	70	30	70	90	100	90
Morningglory	10	80	80	70	80	-	100
Oat, Wild	60	20	40	40	50	50	50
Pigweed	40	40	50	30	90	-	80
Surinam Grass	30	10	10	20	70	20	20
Velvetleaf	50	30	0	20	50	40	60
Wheat	40	0	10	20	30	30	20

Table B	Compounds						
250 g ai/ha	54	72	73	74	152	191	192
Postemergence							
Barnyardgrass	0	0	10	0	40	10	10
Blackgrass	0	50	30	50	20	10	0
Cocklebur	10	0	20	0	90	10	60
Corn	-	0	30	0	30	10	10
Crabgrass, Large	0	0	10	10	20	20	20
Foxtail, Giant	0	0	30	10	20	20	20
Lambsquarters	40	10	10	10	80	80	80
Morningglory	-	0	10	10	60	90	100
Oat, Wild	0	30	40	40	20	20	20
Pigweed	10	0	20	20	90	70	60
Surinam Grass	-	0	10	10	40	10	10
Velvetleaf	0	0	50	30	50	20	50
Wheat	0	10	30	20	10	0	0

Table B	Compounds													
125 g ai/ha	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Postemergence														
Barnyardgrass	0	30	10	10	10	0	0	0	0	0	0	0	10	10
Blackgrass	20	10	0	0	0	20	0	0	30	40	40	10	10	20
Cocklebur	60	50	30	30	20	0	0	0	50	20	10	10	10	10
Corn	0	20	20	20	20	0	0	0	0	0	0	0	0	0
Crabgrass, Large	0	20	0	20	20	20	0	0	0	10	0	0	20	10
Foxtail, Giant	20	30	30	20	20	10	0	0	0	20	20	0	30	20
Lambsquarters	60	80	60	80	60	30	0	0	70	80	60	20	50	50

Morningglory	0	30	20	40	0	0	0	0	0	20	0	0	10	0
Oat, Wild	40	30	20	20	20	10	0	0	40	30	20	10	10	10
Pigweed	50	60	30	40	30	20	0	0	70	80	20	0	30	30
Surinam Grass	0	20	10	10	20	10	0	0	0	20	10	0	10	10
Velvetleaf	40	20	10	20	20	0	0	0	20	70	10	0	20	40
Wheat	10	20	0	10	0	0	0	0	10	10	10	10	0	0

Table B							Compounds							
125 g ai/ha	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Postemergence														
Barnyardgrass	0	10	0	10	0	0	0	0	0	0	0	0	0	10
Blackgrass	10	50	20	20	10	30	20	10	20	30	30	0	60	10
Cocklebur	0	-	10	10	0	0	0	0	0	10	0	0	0	30
Corn	0	10	10	0	0	0	0	0	0	0	0	0	30	0
Crabgrass, Large	10	10	0	0	10	10	10	0	0	0	0	0	70	10
Foxtail, Giant	20	10	10	10	0	10	10	0	0	0	0	0	30	20
Lambsquarters	20	60	60	10	10	30	10	0	0	10	0	0	90	80
Morningglory	0	0	0	10	10	10	0	10	0	10	0	0	20	0
Oat, Wild	10	30	30	20	10	30	10	10	0	20	30	0	50	20
Pigweed	20	40	30	10	10	10	30	10	10	20	0	0	90	90
Surinam Grass	10	10	10	10	10	10	10	0	0	0	0	0	40	20
Velvetleaf	10	40	10	20	0	20	10	0	0	10	0	0	30	30
Wheat	10	20	20	0	0	20	10	0	0	20	10	0	10	10

Table B							Compounds							
125 g ai/ha	29	30	31	32	33	34	35	36	37	40	41	43	44	45
Postemergence														
Barnyardgrass	0	10	10	0	20	20	10	20	20	10	10	30	20	20
Blackgrass	0	10	0	0	20	10	20	10	10	10	10	20	10	10
Cocklebur	50	70	80	10	80	40	50	30	60	10	10	10	40	20
Corn	10	10	30	10	-	-	-	-	-	-	-	20	20	20
Crabgrass, Large	20	10	30	0	20	20	30	30	10	10	20	90	20	30
Foxtail, Giant	10	10	20	0	30	30	20	20	20	0	10	30	20	20
Lambsquarters	70	80	90	70	90	80	80	80	80	40	60	90	80	80
Morningglory	0	10	30	0	-	-	-	-	-	-	-	80	30	40
Oat, Wild	10	20	20	10	10	10	0	20	10	0	10	10	20	0
Pigweed	100	30	60	40	80	90	80	80	60	20	50	100	90	90
Surinam Grass	20	20	30	10	10	20	20	10	10	10	10	40	20	20
Velvetleaf	60	20	30	10	50	40	30	30	20	10	10	80	50	60

Wheat	0	0	10	0	20	30	20	10	20	10	0	20	20	20

Table B							Compounds							
125 g ai/ha	46	47	48	49	50	51	52	55	56	57	58	59	60	61
Postemergence														
Barnyardgrass	10	20	40	30	50	60	0	10	20	10	30	0	10	20
Blackgrass	10	10	0	0	20	0	0	-	0	0	10	0	0	0
Cocklebur	30	10	0	20	90	70	20	10	80	30	80	10	40	60
Corn	20	10	0	20	30	0	10	20	20	20	10	10	10	20
Crabgrass, Large	30	10	10	10	10	20	0	10	10	10	20	10	10	20
Foxtail, Giant	30	30	20	10	30	0	10	0	20	20	20	0	10	20
Lambsquarters	80	80	60	50	80	80	0	70	80	70	90	80	80	90
Morningglory	0	30	0	0	70	0	0	10	0	10	20	20	10	20
Oat, Wild	0	10	10	10	20	0	0	10	20	30	20	10	20	20
Pigweed	90	90	50	30	80	80	0	10	60	70	60	70	70	20
Surinam Grass	30	20	30	10	30	10	0	10	20	10	10	10	10	20
Velvetleaf	60	60	10	30	40	60	10	20	40	20	50	20	20	30
Wheat	20	20	0	0	30	20	0	10	10	10	0	0	0	10

Table B							Compounds							
125 g ai/ha	62	63	64	65	66	67	68	69	70	71	75	76	77	78
Postemergence														
Barnyardgrass	20	10	10	10	0	10	0	0	20	0	10	10	0	30
Blackgrass	10	10	0	10	0	10	10	10	10	0	10	10	20	30
Cocklebur	70	60	30	60	20	0	10	0	50	0	10	40	0	80
Corn	10	20	10	20	10	10	0	0	20	0	10	10	10	-
Crabgrass, Large	10	10	10	10	0	10	0	0	20	0	10	10	0	20
Foxtail, Giant	10	10	10	10	0	10	0	0	20	0	20	20	0	30
Lambsquarters	80	80	70	70	60	40	0	0	80	0	40	30	50	70
Morningglory	20	30	0	10	20	0	0	0	20	0	20	10	0	-
Oat, Wild	10	20	20	10	10	10	10	10	20	0	10	30	40	10
Pigweed	80	40	20	40	20	0	10	10	30	0	50	100	70	80
Surinam Grass	50	10	10	20	10	10	0	0	20	0	10	20	0	20
Velvetleaf	60	40	10	10	10	10	0	0	20	0	20	40	20	70
Wheat	0	10	0	0	0	10	0	0	10	0	10	20	10	30

Table B							Compounds							
125 g ai/ha	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Postemergence														
Barnyardgrass	30	80	70	10	10	20	60	50	0	30	10	0	0	0

Blackgrass	20	20	0	0	0	0	10	10	0	0	0	0	0	0
Cocklebur	80	70	70	80	0	20	90	20	0	10	70	10	0	0
Corn	–	20	10	20	10	10	20	20	0	10	10	10	10	10
Crabgrass, Large	20	100	10	10	30	20	50	60	0	30	10	10	0	0
Foxtail, Giant	30	50	20	10	0	10	20	40	0	30	20	10	0	0
Lambsquarters	70	70	0	20	0	0	50	80	0	70	30	50	20	20
Morningglory	–	100	0	10	0	30	50	60	0	0	20	10	0	0
Oat, Wild	20	30	20	10	10	20	20	30	0	0	20	10	0	0
Pigweed	70	100	50	80	70	80	100	100	0	50	20	30	10	0
Surinam Grass	30	90	40	30	20	50	60	70	0	0	10	10	10	0
Velvetleaf	70	90	80	80	50	60	60	60	0	30	30	10	0	0
Wheat	30	20	20	20	20	20	50	30	0	0	20	10	0	0

Table B							Compounds							
125 g ai/ha	93	94	95	96	97	98	99	100	101	102	104	105	106	107
Postemergence														
Barnyardgrass	10	10	0	0	0	10	0	0	10	0	0	0	0	0
Blackgrass	10	0	0	0	0	0	20	10	20	0	0	0	0	0
Cocklebur	50	20	60	90	0	0	0	0	20	30	0	30	30	0
Corn	10	20	10	10	0	10	10	0	10	20	0	0	10	0
Crabgrass, Large	10	10	0	40	0	20	10	0	10	10	0	0	0	0
Foxtail, Giant	10	10	10	30	0	10	10	0	20	10	0	0	0	0
Lambsquarters	60	50	100	100	50	20	70	0	80	10	0	50	50	10
Morningglory	10	10	0	0	0	0	0	0	10	10	0	0	10	0
Oat, Wild	10	10	10	20	0	0	20	20	30	20	0	0	10	0
Pigweed	10	10	90	70	0	10	20	0	80	80	10	0	10	0
Surinam Grass	10	10	20	20	0	10	10	0	10	70	0	0	10	10
Velvetleaf	10	10	50	70	0	10	20	0	20	0	0	0	0	0
Wheat	10	0	10	10	0	0	20	10	10	0	0	0	0	0

Table B							Compounds							
125 g ai/ha	108	109	110	112	113	114	115	117	118	119	120	121	122	123
Postemergence														
Barnyardgrass	10	10	10	50	30	20	10	20	10	0	10	0	0	0
Blackgrass	0	0	0	20	10	10	10	0	0	0	0	0	0	0
Cocklebur	70	30	10	60	100	80	80	30	70	0	30	10	70	0
Corn	10	10	10	40	30	–	–	–	20	10	–	0	10	0
Crabgrass, Large	20	10	10	20	30	30	10	10	20	20	10	10	10	0
Foxtail, Giant	10	20	10	20	30	30	20	10	10	10	10	0	10	0

Lambsquarters	90	10	40	90	90	80	80	60	0	0	0	80	0	0
Morningglory	30	0	20	20	20	-	-	-	20	0	-	0	0	0
Oat, Wild	20	20	0	40	40	10	10	10	20	10	10	10	10	0
Pigweed	80	20	20	90	90	90	80	50	60	0	10	30	0	0
Surinam Grass	10	10	20	20	40	10	60	30	40	10	20	10	10	0
Velvetleaf	50	10	30	30	20	50	60	20	20	0	10	10	10	0
Wheat	10	10	10	20	10	20	30	10	10	0	10	0	0	0

Table B	Compounds													
125 g ai/ha	124	125	126	127	128	130	131	132	133	134	135	136	137	138
Postemergence														
Barnyardgrass	0	0	0	10	20	50	10	50	0	20	20	50	30	10
Blackgrass	0	0	0	10	10	20	10	10	0	0	0	30	10	0
Cocklebur	0	0	50	10	90	100	70	90	10	80	40	100	50	40
Corn	0	0	0	-	-	20	20	20	10	20	20	10	10	20
Crabgrass, Large	10	0	40	20	20	70	20	30	10	30	20	10	10	20
Foxtail, Giant	0	0	20	20	20	20	20	30	0	30	30	10	10	20
Lambsquarters	30	0	0	70	0	90	80	100	60	80	70	100	80	80
Morningglory	0	0	0	-	-	100	20	60	10	20	30	20	0	20
Oat, Wild	0	0	30	10	10	40	20	20	20	30	20	50	30	20
Pigweed	20	0	40	30	20	100	30	70	20	80	80	60	90	60
Surinam Grass	10	0	20	10	10	50	20	40	0	20	30	20	20	20
Velvetleaf	0	0	0	0	50	70	10	60	10	30	20	60	40	20
Wheat	0	0	0	0	0	20	10	10	0	10	20	20	10	20

Table B	Compounds													
125 g ai/ha	139	140	141	142	143	144	145	146	147	148	149	150	151	153
Postemergence														
Barnyardgrass	10	0	0	0	0	70	0	20	20	0	0	10	0	30
Blackgrass	0	0	20	40	0	20	10	10	10	0	10	0	10	10
Cocklebur	20	0	0	40	0	30	0	20	0	20	20	60	0	50
Corn	10	0	0	0	0	20	10	10	10	10	10	10	10	10
Crabgrass, Large	10	0	10	0	0	30	10	10	20	10	10	10	0	10
Foxtail, Giant	10	0	20	30	0	40	30	20	30	10	10	0	10	10
Lambsquarters	80	20	60	60	0	90	60	80	80	10	20	50	0	80
Morningglory	10	0	20	0	0	50	0	0	0	10	20	20	10	10
Oat, Wild	10	0	10	20	0	20	10	10	0	10	10	20	10	20
Pigweed	60	0	30	50	0	100	90	80	80	10	50	70	10	20
Surinam Grass	10	0	10	10	10	60	20	10	20	10	10	10	10	30

Velvetleaf	20	0	20	10	0	80	50	50	60	10	10	20	10	50
Wheat	10	0	20	10	0	20	0	0	0	10	10	10	10	10

Table B	Compounds													
125 g ai/ha	154	155	156	157	158	159	160	161	162	163	164	165	166	167
Postemergence														
Barnyardgrass	20	10	10	0	0	0	0	10	0	0	0	0	0	0
Blackgrass	10	40	30	10	20	–	–	40	20	10	0	0	0	0
Cocklebur	60	60	40	10	20	80	20	20	10	10	0	0	0	0
Corn	10	10	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	10	20	10	0	30	0	0	0	20	20	0	0	0	0
Foxtail, Giant	10	20	20	30	0	40	30	20	20	0	0	0	0	0
Lambsquarters	80	70	60	20	80	90	70	70	80	50	0	0	0	0
Morningglory	60	30	20	0	0	10	0	20	0	0	0	0	0	0
Oat, Wild	10	40	40	10	30	–	10	30	20	10	0	0	0	0
Pigweed	20	60	30	40	50	80	40	20	40	60	0	0	0	0
Surinam Grass	30	20	10	20	0	0	10	20	0	0	0	0	0	0
Velvetleaf	20	20	60	50	50	20	70	20	60	40	0	0	0	0
Wheat	10	20	20	10	10	–	–	10	10	0	0	0	0	0

Table B	Compounds													
125 g ai/ha	168	169	170	171	179	180	181	182	183	184	185	186	187	188
Postemergence														
Barnyardgrass	50	0	0	0	0	0	0	30	0	0	30	10	10	10
Blackgrass	10	0	0	0	0	0	0	0	0	0	0	10	0	10
Cocklebur	70	0	0	0	0	0	20	50	50	30	20	60	30	20
Corn	50	10	0	0	0	0	20	30	20	20	20	20	0	10
Crabgrass, Large	20	10	10	0	0	0	10	30	20	20	20	10	10	10
Foxtail, Giant	20	0	0	10	0	0	20	0	20	30	20	10	10	10
Lambsquarters	70	40	60	10	0	0	70	60	70	60	60	10	0	60
Morningglory	70	20	30	0	0	0	20	50	60	0	40	20	20	20
Oat, Wild	20	10	10	0	0	0	20	20	10	20	10	10	10	20
Pigweed	70	20	30	10	0	0	40	50	70	30	60	60	20	50
Surinam Grass	20	0	10	10	0	0	20	10	0	10	20	10	10	10
Velvetleaf	20	0	10	0	0	0	10	0	40	30	30	60	0	10
Wheat	20	0	0	0	0	0	0	0	0	0	0	10	0	0

Table B	Compounds													
125 g ai/ha	189	190	193	194	195	196	197	198	199	200	201	202	203	204
Postemergence														
Barnyardgrass	0	0	0	0	40	0	0	0	0	0	0	0	0	10
Blackgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Cocklebur	0	0	20	10	30	0	0	60	10	10	10	30	0	90
Corn	10	10	10	0	20	0	10	20	10	10	10	10	0	20
Crabgrass, Large	10	10	10	10	20	30	0	10	10	0	0	0	0	10
Foxtail, Giant	0	10	10	0	20	0	0	20	10	10	0	10	0	10
Lambsquarters	50	30	90	-	0	0	0	70	60	60	40	50	10	30
Morningglory	80	50	30	10	0	0	0	60	40	0	0	20	0	20
Oat, Wild	10	10	0	0	10	0	10	20	10	0	10	10	0	10
Pigweed	30	30	20	20	70	10	0	50	10	10	10	30	0	50
Surinam Grass	10	10	10	10	10	0	10	20	10	10	0	10	10	20
Velvetleaf	20	20	50	10	20	0	0	20	20	10	0	10	0	60
Wheat	0	0	10	0	10	0	0	0	0	0	0	0	0	10

Table B	Compounds													
125 g ai/ha	205	206	207	209	210	211	212	213	214	215	216	217	218	219
Postemergence														
Barnyardgrass	10	0	20	10	20	10	10	0	0	0	0	0	0	0
Blackgrass	0	0	0	0	10	10	10	20	0	0	0	0	0	0
Cocklebur	40	20	40	30	60	30	80	0	0	30	0	0	0	0
Corn	20	20	20	20	20	10	20	0	0	0	0	0	0	0
Crabgrass, Large	10	10	20	20	20	10	10	0	0	0	0	0	0	0
Foxtail, Giant	20	20	20	20	20	10	10	0	0	0	0	0	0	0
Lambsquarters	60	30	50	40	70	60	90	0	0	0	0	0	0	0
Morningglory	30	20	10	20	30	10	10	10	0	0	0	0	0	0
Oat, Wild	20	20	20	20	20	10	20	10	0	10	0	0	0	0
Pigweed	40	30	30	30	40	10	60	0	0	20	0	0	0	10
Surinam Grass	20	10	20	20	20	10	30	10	0	0	0	0	0	0
Velvetleaf	20	20	20	20	30	30	50	0	0	40	0	0	0	0
Wheat	10	20	20	10	20	10	10	0	0	0	0	0	0	0

Table B	Compounds													
125 g ai/ha	220	221	222	223	224	225	226	227	228	229	230	231	232	233
Postemergence														
Barnyardgrass	0	0	10	10	10	10	10	-	30	20	0	10	-	-
Blackgrass	0	0	0	0	0	20	20	20	30	30	30	20	0	0

Cocklebur	0	0	20	10	10	20	10	20	30	20	0	10	10	20
Corn	10	10	0	10	10	10	10	30	10	10	10	10	10	10
Crabgrass, Large	10	0	10	10	10	10	20	30	20	10	10	20	10	10
Foxtail, Giant	0	10	10	10	20	10	20	10	30	30	10	20	10	0
Lambsquarters	10	0	50	60	60	50	40	50	70	70	50	60	50	50
Morningglory	0	0	40	40	30	10	30	50	70	10	30	20	30	50
Oat, Wild	0	0	0	0	0	0	30	0	40	30	20	20	0	0
Pigweed	10	10	40	60	40	40	30	20	50	60	40	50	-	60
Surinam Grass	0	0	10	10	10	10	10	10	20	10	10	10	10	10
Velvetleaf	0	0	50	20	20	30	30	20	60	60	20	30	30	30
Wheat	0	0	0	0	0	10	20	0	30	30	10	20	0	0

Table B	Compounds													
125 g ai/ha	234	235	236	237	238	239	240	241	242	243	244	245	246	247
Postemergence														
Barnyardgrass	-	-	-	-	0	0	0	0	50	10	10	40	30	0
Blackgrass	0	0	0	0	0	0	0	0	10	0	10	0	0	0
Cocklebur	10	0	20	10	0	0	0	20	40	10	30	40	20	0
Corn	0	20	20	20	0	0	0	0	10	10	10	10	0	0
Crabgrass, Large	10	10	0	10	0	0	0	0	30	10	10	10	10	10
Foxtail, Giant	0	10	10	10	0	0	0	0	20	10	20	30	30	10
Lambsquarters	30	40	60	60	0	0	20	30	90	70	40	80	50	60
Morningglory	30	-	10	20	0	0	20	20	20	0	10	10	0	20
Oat, Wild	20	10	20	0	0	0	0	0	10	0	30	20	10	0
Pigweed	30	30	60	30	0	20	0	30	60	20	50	60	50	60
Surinam Grass	0	10	0	20	0	0	0	10	30	10	20	30	20	10
Velvetleaf	20	20	20	30	0	0	0	10	50	50	40	70	30	30
Wheat	0	0	10	10	0	0	0	0	10	0	10	10	0	0

Table B	Compounds													
125 g ai/ha	248	249	250	252	253	254	256	257	258	259	260	261	262	263
Postemergence														
Barnyardgrass	10	10	20	0	0	0	0	0	0	0	0	0	0	0
Blackgrass	20	20	10	10	20	0	0	0	10	10	10	0	0	10
Cocklebur	30	30	30	20	10	20	0	0	20	0	10	0	0	0
Corn	20	10	20	10	0	0	0	0	0	10	0	10	0	0
Crabgrass, Large	10	10	20	0	0	10	0	0	0	0	0	0	0	10
Foxtail, Giant	30	20	20	20	0	0	0	0	0	0	0	0	10	0
Lambsquarters	60	10	0	30	20	10	30	20	30	10	10	10	50	70

Morningglory	20	20	20	20	0	20	0	0	0	0	0	0	0	0
Oat, Wild	30	30	20	20	20	20	10	10	20	10	20	0	0	10
Pigweed	60	20	30	20	20	10	30	60	50	30	20	20	70	60
Surinam Grass	10	10	10	10	0	10	0	0	0	10	0	0	0	10
Velvetleaf	30	10	20	30	10	10	10	0	0	0	0	0	20	20
Wheat	30	30	20	20	20	10	10	0	20	10	20	0	0	10

Table B	Compounds													
125 g ai/ha	264	265	266	267	268	269	270	271	272	273	274	275	276	277
Postemergence														
Barnyardgrass	0	0	0	40	0	10	0	0	20	20	0	0	0	0
Blackgrass	0	0	20	20	30	20	0	10	60	50	30	40	30	10
Cocklebur	0	0	0	30	20	20	0	0	40	20	0	0	10	0
Corn	0	0	0	20	20	10	0	0	30	10	0	0	0	0
Crabgrass, Large	0	0	0	20	0	10	0	0	10	30	0	0	10	0
Foxtail, Giant	0	0	0	40	10	30	0	0	10	10	20	0	10	0
Lambsquarters	0	0	60	30	60	50	0	10	100	60	40	50	20	20
Morningglory	0	0	30	30	10	20	0	0	90	20	0	0	10	0
Oat, Wild	0	0	10	30	30	20	0	20	60	30	20	30	30	10
Pigweed	0	0	20	60	20	60	0	50	100	80	40	60	40	0
Surinam Grass	0	0	10	30	10	10	0	0	10	30	20	10	10	0
Velvetleaf	0	0	0	50	20	10	0	0	50	40	10	0	10	20
Wheat	0	0	20	20	30	20	0	30	30	30	30	20	20	20

Table B	Compounds													
125 g ai/ha	278	279	280	281	282	283	284	285	286	287	288	289	290	291
Postemergence														
Barnyardgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blackgrass	20	10	20	20	20	20	20	30	10	10	20	10	20	0
Cocklebur	10	0	0	20	10	0	0	10	10	10	0	0	0	0
Corn	10	10	0	0	10	0	0	10	0	0	0	0	0	0
Crabgrass, Large	0	0	0	10	10	0	0	0	0	0	0	0	0	0
Foxtail, Giant	0	0	0	10	20	0	0	30	20	20	0	20	20	10
Lambsquarters	20	10	10	20	10	0	50	40	10	10	0	0	10	20
Morningglory	0	0	0	0	10	0	0	20	0	0	0	0	0	0
Oat, Wild	20	20	10	10	0	0	10	40	30	20	20	20	20	10
Pigweed	10	30	10	20	20	0	60	70	60	20	10	10	10	0
Surinam Grass	10	10	0	10	10	0	0	10	10	0	0	0	0	0
Velvetleaf	10	10	10	0	10	0	0	10	10	0	10	0	0	0

Wheat	30	30	20	30	30	20	20	30	20	10	20	20	20	0

Table B							Compounds							
125 g ai/ha	292	293	294	295	296	297	298	299	300	301	302	303	304	305
Postemergence														
Barnyardgrass	0	0	20	30	30	10	10	10	30	20	10	40	20	0
Blackgrass	10	30	20	30	30	10	20	20	10	10	10	20	10	20
Cocklebur	0	20	30	40	50	0	20	20	10	10	10	10	0	10
Corn	10	10	10	10	30	10	0	0	30	50	10	70	40	70
Crabgrass, Large	0	0	10	30	30	20	20	10	10	20	0	10	10	0
Foxtail, Giant	0	20	30	60	60	20	10	10	30	10	0	50	30	20
Lambsquarters	30	50	70	40	50	10	40	40	70	70	60	80	80	50
Morningglory	0	30	10	50	50	0	60	70	90	60	30	80	100	0
Oat, Wild	10	30	40	40	30	0	30	20	30	20	0	30	30	10
Pigweed	20	10	30	100	90	0	80	90	80	80	80	70	90	0
Surinam Grass	0	10	20	50	40	20	20	20	10	10	0	10	0	0
Velvetleaf	10	10	40	70	90	0	60	60	40	30	10	30	10	20
Wheat	0	20	30	20	20	0	20	20	10	10	0	10	10	0

Table B							Compounds							
125 g ai/ha	306	307	308	309	310	311	312	313	314	315	316	317	318	319
Postemergence														
Barnyardgrass	10	0	0	20	0	0	0	30	10	10	0	0	40	0
Blackgrass	10	10	10	10	10	0	0	0	10	0	0	0	10	0
Cocklebur	30	20	0	40	0	0	0	0	10	20	0	0	10	30
Corn	30	-	0	20	0	0	0	10	10	10	10	0	20	20
Crabgrass, Large	10	10	0	0	10	0	0	10	10	0	10	0	10	20
Foxtail, Giant	10	20	10	20	10	0	0	20	20	0	0	0	10	20
Lambsquarters	70	60	50	40	60	0	10	60	30	50	40	0	80	50
Morningglory	-	0	0	0	0	0	0	0	20	0	10	0	0	10
Oat, Wild	20	0	10	20	30	0	0	20	10	0	0	0	0	30
Pigweed	70	50	60	50	50	0	0	60	60	10	10	0	70	30
Surinam Grass	10	10	10	10	10	0	0	10	20	20	10	0	10	10
Velvetleaf	40	10	10	20	20	0	0	60	20	20	0	0	40	10
Wheat	10	0	10	20	10	0	0	0	0	0	0	0	0	10

Table B							Compounds							
125 g ai/ha	329	330	331	332	333	334	335	336	338	340	341	342	343	344
Postemergence														
Barnyardgrass	0	0	10	20	10	0	0	10	20	10	10	10	10	0

Blackgrass	20	0	10	40	30	30	10	10	20	20	10	20	0	0
Cocklebur	0	0	10	30	20	20	10	0	10	0	10	10	0	0
Corn	0	0	0	0	10	0	10	10	10	0	0	10	10	10
Crabgrass, Large	0	0	10	50	40	10	10	20	20	10	10	10	20	0
Foxtail, Giant	10	0	0	30	30	10	20	20	20	20	30	20	30	10
Lambsquarters	30	0	60	80	90	70	10	60	10	30	30	60	40	20
Morningglory	0	10	0	40	30	50	10	40	60	10	20	30	30	10
Oat, Wild	20	0	10	40	40	20	20	10	0	20	0	20	10	0
Pigweed	50	0	10	100	90	40	20	60	60	50	30	40	40	30
Surinam Grass	10	0	10	20	20	20	10	20	20	10	10	10	10	0
Velvetleaf	10	0	10	60	50	50	30	20	30	20	20	20	20	20
Wheat	20	0	20	30	20	10	10	0	0	0	10	0	0	0

Table B	Compounds													
125 g ai/ha	345	346	347	348	349	350	351	352	353	354	355	356	357	358
Postemergence														
Barnyardgrass	0	20	0	0	0	0	0	0	10	0	0	0	0	10
Blackgrass	0	40	30	20	20	0	0	10	10	10	0	0	0	10
Cocklebur	0	30	0	0	0	0	0	0	10	10	0	-	10	0
Corn	0	0	0	0	0	0	0	0	10	0	0	0	0	0
Crabgrass, Large	0	0	0	0	20	0	0	20	10	0	10	10	0	10
Foxtail, Giant	0	20	0	0	0	0	0	10	20	10	20	30	30	10
Lambsquarters	20	30	10	0	0	0	0	10	20	10	10	10	30	30
Morningglory	10	10	0	0	0	0	0	10	10	30	10	0	10	20
Oat, Wild	0	40	0	20	10	0	0	0	10	0	0	0	0	20
Pigweed	20	70	0	0	0	0	0	10	30	40	20	30	20	20
Surinam Grass	0	10	0	0	0	0	0	10	0	0	10	10	10	10
Velvetleaf	10	10	0	0	0	0	0	10	20	-	30	-	20	10
Wheat	0	20	0	20	0	0	0	10	0	0	0	0	0	0

Table B	Compounds							
125 g ai/ha	359	360	361	362	363	364	365	366
Postemergence								
Barnyardgrass	10	0	0	0	0	10	0	10
Blackgrass	20	30	10	10	20	30	40	40
Cocklebur	10	10	10	10	20	40	20	30
Corn	10	10	0	0	0	10	0	10
Crabgrass, Large	10	10	10	0	10	30	0	10
Foxtail, Giant	20	30	20	10	10	10	20	20

Lambsquarters	40	0	70	10	30	70	90	80
Morningglory	10	0	10	10	50	20	80	-
Oat, Wild	20	40	0	20	20	20	30	40
Pigweed	20	30	20	20	20	40	40	50
Surinam Grass	10	10	10	10	10	30	10	10
Velvetleaf	20	40	10	0	10	20	10	10
Wheat	0	30	0	0	10	10	20	20

Table B				Compounds					
62 g ai/ha	54	72	73	74	129	152	191	192	251
Postemergence									
Barnyardgrass	0	0	0	0	0	30	0	0	0
Blackgrass	0	40	30	30	0	20	0	0	50
Cocklebur	10	0	20	0	60	60	0	0	0
Corn	10	0	0	0	-	30	10	10	0
Crabgrass, Large	0	0	0	0	0	10	20	10	0
Foxtail, Giant	0	0	10	10	10	10	10	10	0
Lambsquarters	40	0	0	0	0	70	60	70	10
Morningglory	10	0	10	0	-	50	40	60	0
Oat, Wild	0	20	20	30	0	10	10	10	20
Pigweed	0	0	10	20	0	50	30	30	10
Surinam Grass	0	0	10	0	0	30	10	10	0
Velvetleaf	0	0	30	0	0	50	10	20	10
Wheat	0	10	20	20	0	10	0	0	20

Table B	Compounds		
31 g ai/ha	49	169	346
Postemergence			
Barnyardgrass	10	0	0
Blackgrass	0	0	30
Cocklebur	10	30	10
Corn	10	10	0
Crabgrass, Large	10	10	0
Foxtail, Giant	0	0	0
Lambsquarters	20	50	0
Morningglory	0	20	0
Oat, Wild	0	10	30
Pigweed	10	50	60
Surinam Grass	10	10	0

Table B	Compound
16 g ai/ha	251
Postemergence	
Barnyardgrass	0
Blackgrass	10
Cocklebur	0
Corn	0
Crabgrass, Large	0
Foxtail, Giant	0
Lambsquarters	0
Morningglory	0
Oat, Wild	20
Pigweed	0
Surinam Grass	0

Velvetleaf	10	10	0	Velvetleaf	0
Wheat	0	0	10	Wheat	20

Table B	Compounds													
500 g ai/ha	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Preemergence														
Barnyardgrass	100	100	100	100	90	100	90	0	100	100	100	40	100	100
Cocklebur	100	90	50	0	0	100	70	0	80	100	50	0	-	80
Corn	70	80	60	60	0	90	70	0	60	50	80	0	70	90
Crabgrass, Large	100	100	100	90	100	100	100	0	100	100	100	10	100	100
Foxtail, Giant	100	100	100	100	100	100	100	0	100	100	100	20	100	100
Lambsquarters	100	100	100	100	90	100	100	80	100	100	100	0	100	100
Morningglory	70	90	60	30	0	-	90	0	30	30	10	30	100	100
Pigweed	100	100	100	100	100	100	100	30	100	100	100	0	100	100
Rice	80	90	90	60	20	100	80	10	90	80	80	0	90	100
Surinam Grass	90	100	90	90	50	100	60	0	90	90	100	10	100	100
Velvetleaf	100	100	100	100	60	100	70	0	100	100	80	10	100	100
Wheat	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B	Compounds													
500 g ai/ha	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Preemergence														
Barnyardgrass	100	100	100	90	70	70	80	0	0	30	0	0	100	90
Cocklebur	0	100	100	60	100	20	0	0	0	0	-	0	60	0
Corn	30	70	60	50	0	10	0	0	0	0	0	0	90	10
Crabgrass, Large	100	100	90	100	100	100	100	10	10	60	0	0	100	50
Foxtail, Giant	100	100	90	100	90	70	40	10	0	80	0	0	100	60
Lambsquarters	100	100	100	100	90	90	80	0	0	0	0	-	100	100
Morningglory	10	50	10	100	60	80	20	10	0	0	0	0	40	30
Pigweed	100	100	100	100	100	100	80	0	0	100	0	0	100	100
Rice	50	90	70	90	40	50	30	0	0	0	0	0	-	-
Surinam Grass	90	90	70	70	70	60	50	0	0	10	0	0	90	70
Velvetleaf	80	100	100	100	100	30	30	0	0	0	0	0	100	100

Table B	Compounds													
500 g ai/ha	29	30	31	32	33	34	35	36	37	40	41	42	43	44
Preemergence														
Barnyardgrass	100	90	90	60	90	80	100	80	60	40	80	30	100	100
Cocklebur	90	10	40	0	30	10	30	0	0	0	0	0	10	20
Corn	50	10	20	0	30	0	40	10	10	0	0	0	10	0

Crabgrass, Large	100	60	50	60	100	100	90	20	90	70	100	70	100	100
Foxtail, Giant	100	80	90	10	100	90	100	30	60	10	70	10	80	70
Lambsquarters	90	100	100	100	100	100	100	100	100	80	100	80	100	100
Morningglory	100	60	80	60	-	20	10	10	0	10	10	10	10	10
Pigweed	100	100	100	70	100	100	100	100	100	60	70	40	100	100
Surinam Grass	80	20	60	30	80	80	80	50	40	10	60	20	50	40
Velvetleaf	90	70	90	70	80	60	60	50	20	10	10	10	100	100

Table B							Compounds							
500 g ai/ha	45	46	47	48	50	51	52	55	56	57	58	59	60	61
Preemergence														
Barnyardgrass	100	100	90	90	80	100	60	100	80	70	100	70	100	60
Cocklebur	80	30	40	50	0	50	10	10	20	10	100	0	0	0
Corn	30	10	10	0	10	50	0	20	20	0	30	0	0	10
Crabgrass, Large	90	100	100	80	90	100	90	100	100	100	100	20	100	100
Foxtail, Giant	100	100	90	90	100	100	60	100	100	100	100	40	100	80
Lambsquarters	100	100	100	90	100	100	90	100	100	100	100	100	90	100
Morningglory	30	20	30	40	40	0	0	10	20	0	30	10	20	20
Pigweed	100	100	100	100	100	100	90	100	100	100	100	100	100	100
Rice	-	-	-	60	50	50	80	70	70	-	80	0	50	0
Surinam Grass	50	70	70	80	50	80	30	80	60	40	60	10	50	30
Velvetleaf	100	100	100	100	50	100	20	30	100	0	100	40	90	90

Table B							Compounds							
500 g ai/ha	62	63	64	65	66	67	68	69	70	71	75	76	77	78
Preemergence														
Barnyardgrass	80	100	90	90	30	80	10	0	50	0	90	100	70	0
Cocklebur	10	10	0	0	0	0	0	-	0	0	10	40	0	0
Corn	10	30	0	10	0	-	0	0	20	0	30	50	40	0
Crabgrass, Large	100	100	100	80	10	20	0	0	100	0	70	90	80	10
Foxtail, Giant	90	100	100	80	10	10	0	0	100	0	90	100	60	30
Lambsquarters	100	100	100	100	50	10	90	40	0	0	80	90	90	0
Morningglory	10	10	0	10	0	0	30	20	20	0	10	80	0	10
Pigweed	100	100	100	100	30	60	90	0	50	0	90	100	100	30
Rice	10	80	60	50	0	50	0	0	10	0	70	60	60	-
Surinam Grass	40	80	50	50	10	50	0	0	40	0	70	90	40	10
Velvetleaf	100	70	40	60	0	20	10	0	70	0	70	90	30	10

Table B	Compounds													
500 g ai/ha	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Preemergence														
Barnyardgrass	10	20	60	0	0	0	0	0	70	90	0	20	10	0
Cocklebur	0	0	0	0	0	–	0	0	0	0	0	0	–	0
Corn	0	10	0	0	0	0	0	0	0	60	0	20	10	0
Crabgrass, Large	0	0	10	0	0	0	0	0	100	100	80	70	–	10
Foxtail, Giant	10	70	60	0	0	0	0	0	80	90	0	60	10	10
Lambsquarters	0	0	0	0	0	0	0	0	100	100	0	90	30	0
Morningglory	0	20	60	0	0	0	0	–	0	0	0	10	10	0
Pigweed	0	0	80	0	0	0	0	0	90	100	0	80	0	0
Rice	–	–	0	0	0	0	0	0	60	60	0	0	10	0
Surinam Grass	10	10	10	0	0	0	0	0	20	80	0	20	–	0
Velvetleaf	10	20	80	0	0	0	0	0	40	60	0	20	–	0

Table B	Compounds													
500 g ai/ha	93	94	95	96	97	98	99	100	101	103	104	105	106	107
Preemergence														
Barnyardgrass	20	20	80	90	0	0	30	0	70	90	80	30	70	0
Cocklebur	0	0	0	0	0	0	0	0	90	0	0	0	0	0
Corn	10	0	60	70	0	0	0	0	40	50	0	0	0	0
Crabgrass, Large	20	20	90	100	0	0	70	0	90	100	90	90	100	10
Foxtail, Giant	30	30	100	90	0	0	20	0	60	80	20	10	40	0
Lambsquarters	70	0	100	100	0	0	20	0	100	100	80	80	100	30
Morningglory	10	0	–	10	0	0	0	0	10	100	20	10	10	10
Pigweed	70	20	100	100	0	0	–	0	100	100	70	80	70	0
Rice	0	0	50	70	0	0	0	0	40	–	–	–	–	–
Surinam Grass	0	0	70	80	0	0	30	0	30	40	20	10	20	10
Velvetleaf	10	0	60	90	0	0	20	0	50	70	0	0	0	0

Table B	Compounds													
500 g ai/ha	108	109	110	112	113	114	115	117	118	119	120	121	122	123
Preemergence														
Barnyardgrass	90	100	10	70	90	80	100	90	90	10	90	80	90	0
Cocklebur	30	20	10	0	20	10	40	30	10	0	0	0	70	0
Corn	30	10	0	0	0	10	30	30	10	0	0	0	30	0
Crabgrass, Large	100	100	100	90	100	100	100	100	100	80	90	50	100	0
Foxtail, Giant	100	100	20	20	30	90	100	80	70	0	70	70	80	0
Lambsquarters	100	90	90	90	100	100	100	100	0	0	20	100	100	0

Morningglory	70	100	60	60	50	-	90	60	60	10	-	20	70	0
Pigweed	100	100	10	90	100	100	100	90	90	0	30	100	80	0
Surinam Grass	80	80	10	20	10	30	70	60	50	10	0	20	70	0
Velvetleaf	100	60	10	50	20	60	100	70	10	10	40	20	60	0

Table B	Compounds													
500 g ai/ha	124	125	126	127	128	129	130	131	132	133	134	135	136	137
Preemergence														
Barnyardgrass	10	0	60	70	90	60	70	90	50	60	80	50	100	70
Cocklebur	0	0	0	20	30	20	0	10	0	0	0	0	10	0
Corn	0	0	0	0	20	0	20	0	10	0	10	0	30	10
Crabgrass, Large	0	0	30	100	100	90	100	100	100	80	100	90	100	100
Foxtail, Giant	10	0	0	70	60	20	70	70	80	40	70	20	100	80
Lambsquarters	80	0	90	70	70	30	70	100	90	100	100	100	100	80
Morningglory	0	-	20	-	30	0	10	30	20	10	20	-	70	20
Pigweed	90	0	70	70	80	30	100	100	100	100	100	100	100	100
Rice	-	-	-	-	-	-	0	50	0	40	50	30	50	10
Surinam Grass	10	0	20	60	60	10	80	60	70	20	50	30	90	80
Velvetleaf	0	0	20	20	80	10	90	100	70	70	90	50	100	60

Table B	Compounds													
500 g ai/ha	138	139	140	141	142	143	144	145	146	147	148	149	150	151
Preemergence														
Barnyardgrass	70	90	80	0	100	0	100	100	90	90	10	90	80	10
Cocklebur	10	10	80	10	40	0	20	20	0	10	0	0	0	0
Corn	10	40	0	0	0	0	10	10	0	10	0	50	20	0
Crabgrass, Large	100	100	100	20	100	0	100	100	100	100	0	100	10	10
Foxtail, Giant	70	100	80	20	100	0	100	100	90	100	20	100	60	10
Lambsquarters	100	100	100	0	100	0	100	100	100	100	-	100	100	0
Morningglory	20	30	-	30	30	0	100	40	10	30	0	40	20	0
Pigweed	100	100	80	30	100	0	100	100	100	100	0	100	100	0
Rice	40	60	70	0	80	-	30	20	40	10	10	30	40	0
Surinam Grass	30	90	60	10	60	0	100	80	30	80	0	80	10	10
Velvetleaf	40	80	20	20	100	0	100	100	90	80	0	40	10	0

Table B	Compounds													
500 g ai/ha	153	154	155	156	157	158	159	160	161	162	163	164	165	166
Preemergence														
Barnyardgrass	90	80	90	100	0	100	90	100	100	100	90	0	0	0
Cocklebur	0	10	30	100	20	40	100	70	0	90	70	0	0	0

Corn	20	0	30	80	0	60	0	20	10	80	40	0	0	0
Crabgrass, Large	80	80	100	100	30	100	70	80	100	100	90	0	0	0
Foxtail, Giant	50	30	90	100	0	100	60	70	100	100	80	0	0	0
Lambsquarters	100	90	100	100	30	100	100	100	100	100	100	0	0	0
Morningglory	10	0	40	100	40	50	40	90	40	80	70	0	0	0
Pigweed	100	100	100	100	40	100	100	100	100	100	100	0	0	0
Rice	20	0	50	100	0	90	70	80	40	90	80	–	0	0
Surinam Grass	70	10	50	100	0	90	70	70	60	100	70	0	0	0
Velvetleaf	100	70	70	100	0	80	90	80	70	100	90	0	0	0

Table B							Compounds							
500 g ai/ha	167	169	170	171	179	180	181	182	183	184	185	186	187	188
Preemergence														
Barnyardgrass	0	10	30	0	0	0	90	80	70	60	70	10	90	100
Cocklebur	–	0	0	0	0	0	30	0	0	0	0	0	0	0
Corn	0	0	0	0	0	0	40	0	0	0	0	10	60	50
Crabgrass, Large	0	40	80	30	0	0	100	100	90	100	50	10	100	100
Foxtail, Giant	0	10	20	0	0	0	100	100	80	70	70	10	70	100
Lambsquarters	0	60	80	0	0	0	100	100	100	80	80	0	40	100
Morningglory	0	10	10	–	0	0	20	30	10	50	50	0	30	–
Pigweed	0	100	90	0	0	0	100	100	100	100	100	0	60	70
Rice	0	0	0	0	–	–	70	50	80	0	0	20	80	70
Surinam Grass	0	10	30	0	0	0	70	60	50	30	20	10	70	70
Velvetleaf	0	0	20	20	0	0	10	70	50	50	50	20	20	100

Table B							Compounds							
500 g ai/ha	189	190	193	194	195	196	197	198	199	200	201	202	203	204
Preemergence														
Barnyardgrass	30	30	100	90	90	40	10	90	90	20	10	90	10	0
Cocklebur	0	0	70	20	0	0	0	20	0	0	0	10	10	0
Corn	0	0	100	50	0	0	0	40	10	0	0	20	0	0
Crabgrass, Large	60	80	100	100	100	100	0	100	100	90	60	100	80	0
Foxtail, Giant	10	10	100	80	60	0	0	100	100	10	0	90	10	0
Lambsquarters	30	50	100	–	80	0	0	100	90	80	30	100	30	0
Morningglory	20	0	100	50	40	0	0	80	60	10	10	30	10	10
Pigweed	100	90	100	100	90	0	0	100	100	90	20	90	90	10
Rice	50	30	100	70	20	–	0	80	20	10	0	30	0	0
Surinam Grass	20	10	100	60	30	0	20	50	70	10	0	60	0	0
Velvetleaf	20	10	100	60	20	20	0	60	60	20	10	20	20	0

Table B	Compounds													
500 g ai/ha	205	206	207	209	210	211	212	213	214	215	216	217	218	219
Preemergence														
Barnyardgrass	90	70	90	90	90	50	90	80	20	60	40	0	0	20
Cocklebur	20	0	20	30	40	0	50	0	0	0	0	0	0	0
Corn	40	40	50	50	70	10	30	10	0	0	0	0	0	0
Crabgrass, Large	90	60	100	60	90	70	100	70	70	80	40	0	20	100
Foxtail, Giant	100	20	90	60	100	50	100	90	90	80	60	0	0	0
Lambsquarters	100	30	100	100	100	80	100	100	80	100	100	0	0	0
Morningglory	30	20	40	20	30	10	60	20	0	20	0	0	0	-
Pigweed	100	80	100	100	100	30	100	100	100	100	90	0	0	80
Rice	70	30	70	70	80	10	20	40	0	0	70	0	0	0
Surinam Grass	80	20	60	50	70	30	70	40	30	70	70	0	0	0
Velvetleaf	80	10	60	50	70	10	80	80	0	60	0	0	0	10

Table B	Compounds													
500 g ai/ha	220	221	222	223	224	225	226	227	228	229	230	231	232	233
Preemergence														
Barnyardgrass	0	90	100	80	90	90	60	60	100	90	50	80	60	10
Cocklebur	0	0	80	20	50	40	0	0	80	40	0	30	0	0
Corn	0	0	90	80	70	70	20	50	80	40	10	50	0	0
Crabgrass, Large	100	100	100	100	100	100	100	100	100	100	70	90	100	90
Foxtail, Giant	10	70	90	80	70	100	70	70	100	80	80	90	30	0
Lambsquarters	70	100	100	100	100	-	90	90	100	100	90	100	90	30
Morningglory	0	0	100	30	30	10	10	20	40	20	10	10	20	0
Pigweed	100	100	100	100	100	100	70	100	100	100	80	100	90	60
Rice	0	20	100	30	80	90	30	70	90	70	0	50	50	0
Surinam Grass	10	30	100	90	100	90	40	70	100	80	10	60	30	20
Velvetleaf	0	50	100	100	100	100	50	100	100	100	30	90	40	10

Table B	Compounds													
500 g ai/ha	234	235	236	237	238	239	240	241	242	243	244	245	246	247
Preemergence														
Barnyardgrass	0	50	90	50	0	60	70	80	100	90	90	100	90	80
Cocklebur	0	0	20	0	0	0	0	0	40	20	20	0	0	0
Corn	-	20	10	20	0	0	0	30	60	50	60	10	20	30
Crabgrass, Large	40	90	70	90	0	100	100	100	100	100	100	100	100	80
Foxtail, Giant	10	50	50	40	0	0	80	90	90	80	90	90	90	70
Lambsquarters	50	90	100	90	0	70	80	100	100	100	100	100	100	100

Morningglory	0	10	20	30	0	0	0	0	10	0	20	20	10	10
Pigweed	40	100	90	70	0	70	100	100	100	100	100	100	100	100
Rice	0	20	60	30	0	0	0	80	80	80	80	50	70	40
Surinam Grass	0	60	60	30	0	0	20	90	90	80	90	80	80	50
Velvetleaf	0	30	80	60	0	0	-	100	100	100	100	90	90	100

Table B							Compounds							
500 g ai/ha	248	249	250	252	253	254	256	257	258	259	260	261	262	263
Preemergence														
Barnyardgrass	20	0	10	70	10	40	70	20	90	70	70	20	10	40
Cocklebur	0	0	0	0	0	0	0	0	0	0	0	0	-	-
Corn	0	0	0	60	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	40	0	10	100	-	100	100	-	50	50	-	50	30	60
Foxtail, Giant	60	0	10	90	30	30	60	50	20	70	30	0	0	20
Lambsquarters	-	-	-	100	-	100	100	-	100	-	100	-	90	100
Morningglory	0	10	0	0	0	10	0	0	10	90	0	0	0	0
Pigweed	-	0	-	100	-	100	100	-	100	100	100	-	100	100
Rice	0	0	10	50	0	20	80	0	90	0	30	60	0	10
Surinam Grass	60	20	30	70	30	40	60	0	30	30	10	0	10	30
Velvetleaf	20	0	20	60	20	20	80	0	60	0	10	30	80	90

Table B							Compounds							
500 g ai/ha	264	265	266	267	268	269	270	271	272	273	274	275	276	277
Preemergence														
Barnyardgrass	10	0	80	70	100	100	50	0	90	90	100	60	80	0
Cocklebur	0	0	10	0	90	70	0	0	0	0	0	0	30	10
Corn	0	0	90	20	90	80	50	10	10	30	80	20	60	0
Crabgrass, Large	50	-	100	100	100	100	20	0	100	100	100	0	70	0
Foxtail, Giant	10	50	100	80	100	100	50	0	90	90	90	20	90	0
Lambsquarters	100	0	100	-	100	100	-	60	100	100	100	100	100	80
Morningglory	0	0	10	30	20	20	0	0	30	10	10	40	10	0
Pigweed	100	0	100	-	100	100	-	20	100	100	100	40	100	100
Rice	0	0	80	40	90	90	60	0	20	40	80	60	80	20
Surinam Grass	10	40	90	50	100	100	20	0	70	50	80	10	60	0
Velvetleaf	10	10	100	50	100	100	70	0	50	40	70	0	50	40

Table B							Compounds							
500 g ai/ha	278	279	280	281	282	283	284	285	286	287	288	289	290	291
Preemergence														
Barnyardgrass	80	40	10	90	50	10	80	90	90	100	70	0	80	0

Cocklebur	0	0	0	0	0	0	0	0	0	60	0	0	0	0
Corn	30	0	0	0	0	0	0	40	50	30	0	0	0	0
Crabgrass, Large	80	80	10	70	80	50	90	70	100	100	0	30	90	0
Foxtail, Giant	80	30	10	60	20	10	10	80	90	90	10	0	80	0
Lambsquarters	100	100	80	100	100	100	100	100	100	100	90	100	100	0
Morningglory	10	0	0	20	0	0	0	10	0	10	0	0	0	0
Pigweed	100	100	100	100	100	100	100	100	100	100	90	100	100	0
Rice	80	50	10	60	40	0	20	80	80	90	70	0	80	0
Surinam Grass	60	40	10	40	20	0	10	70	60	80	0	0	10	0
Velvetleaf	60	30	20	70	30	0	60	100	60	100	0	0	0	0

Table B							Compounds							
500 g ai/ha	292	293	294	295	296	297	298	299	300	301	302	303	304	305
Preemergence														
Barnyardgrass	90	100	100	20	60	20	90	100	90	100	60	90	70	90
Cocklebur	40	90	100	0	0	0	0	60	20	0	0	30	0	70
Corn	80	100	100	10	40	0	70	90	70	10	10	70	–	60
Crabgrass, Large	100	100	100	80	100	80	100	100	100	100	100	100	100	100
Foxtail, Giant	70	100	100	70	90	60	100	100	100	90	30	100	90	100
Lambsquarters	100	100	100	–	100	80	100	100	100	100	100	100	100	100
Morningglory	30	100	30	20	20	10	40	100	60	80	10	50	10	0
Pigweed	100	100	100	–	80	40	100	100	100	100	100	100	100	100
Rice	90	100	100	20	40	10	60	90	70	70	10	80	20	80
Surinam Grass	100	100	100	20	60	20	100	100	100	100	30	100	70	100
Velvetleaf	70	100	100	60	80	10	60	100	100	100	80	100	100	100

Table B							Compounds							
500 g ai/ha	306	307	308	309	310	311	312	313	314	315	316	317	318	319
Preemergence														
Barnyardgrass	90	100	80	100	90	0	0	90	90	20	0	0	90	80
Cocklebur	50	100	0	80	50	0	0	10	0	0	0	0	0	10
Corn	100	80	70	90	70	0	0	30	10	0	0	0	0	40
Crabgrass, Large	100	100	70	100	100	0	0	90	30	20	20	0	90	100
Foxtail, Giant	100	90	90	100	100	0	0	100	100	30	0	0	80	50
Lambsquarters	100	100	100	90	100	0	0	100	80	80	60	0	100	100
Morningglory	10	10	10	0	10	0	0	40	20	0	0	0	30	20
Pigweed	100	100	100	100	100	0	0	100	100	100	90	0	100	100
Rice	80	90	50	90	80	–	–	40	10	0	0	0	50	70
Surinam Grass	90	90	60	100	70	0	0	80	80	10	0	0	40	60

Velvetleaf	100	100	100	100	100	0	0	100	100	20	20	0	–	30

Table B	Compounds													
500 g ai/ha	329	330	331	332	333	334	335	336	338	340	341	342	343	344
Preemergence														
Barnyardgrass	0	0	70	60	20	100	60	100	80	100	100	100	100	70
Cocklebur	0	0	0	0	0	100	10	40	0	50	100	90	90	70
Corn	0	0	40	0	0	70	50	100	10	–	–	–	–	90
Crabgrass, Large	0	0	80	100	70	100	100	100	100	100	100	100	100	–
Foxtail, Giant	0	0	80	60	20	100	90	100	100	100	90	90	100	60
Lambsquarters	–	0	100	100	100	100	10	100	100	100	100	100	100	100
Morningglory	0	0	0	30	10	70	10	70	10	–	30	70	100	80
Pigweed	0	0	50	100	100	100	10	100	100	100	100	100	100	90
Rice	0	0	40	40	0	–	–	–	–	–	–	–	–	–
Surinam Grass	0	0	60	20	20	100	40	100	60	100	100	100	100	100
Velvetleaf	0	0	80	80	80	100	70	100	80	100	100	100	100	100
Wheat	–	–	–	–	–	90	30	100	20	100	100	100	100	80

Table B	Compounds													
500 g ai/ha	345	347	348	349	350	351	352	353	354	355	356	357	358	359
Preemergence														
Barnyardgrass	30	0	0	100	0	0	90	90	60	90	80	80	100	90
Cocklebur	10	0	0	80	0	0	0	20	0	10	20	30	90	30
Corn	10	0	0	80	0	0	80	–	20	60	50	80	100	60
Crabgrass, Large	90	0	0	100	0	0	100	80	80	100	90	100	100	100
Foxtail, Giant	30	0	0	100	0	0	100	50	70	90	80	100	100	100
Lambsquarters	100	0	0	100	0	0	100	–	100	100	100	100	100	100
Morningglory	50	0	0	30	0	0	0	20	0	10	10	70	100	50
Pigweed	100	0	0	100	0	0	70	–	90	100	100	100	100	100
Rice	–	–	–	–	–	0	–	–	–	–	–	–	–	–
Surinam Grass	70	0	0	90	0	0	100	30	20	80	60	80	100	70
Velvetleaf	40	0	0	100	0	0	100	60	50	0	70	60	100	50
Wheat	20	0	0	90	0	–	70	20	10	30	20	90	90	70

Table B	Compounds						
500 g ai/ha	360	361	362	363	364	365	366
Preemergence							
Barnyardgrass	40	100	70	50	100	100	90
Cocklebur	0	50	10	10	100	60	20
Corn	40	70	60	30	100	100	70

Crabgrass, Large	80	100	100	90	100	100	100
Foxtail, Giant	90	100	80	90	100	100	90
Lambsquarters	40	100	70	80	100	100	90
Morningglory	10	60	10	0	100	90	50
Pigweed	50	100	100	60	100	100	100
Surinam Grass	50	90	50	60	100	100	80
Velvetleaf	40	80	20	30	100	100	60
Wheat	40	80	30	30	100	100	90

Table B			Compounds				
250 g ai/ha	54	72	73	74	152	191	192
Preemergence							
Barnyardgrass	10	0	10	0	90	10	70
Cocklebur	0	–	0	10	10	0	0
Corn	0	0	20	0	50	0	40
Crabgrass, Large	40	0	10	0	100	40	90
Foxtail, Giant	10	0	20	10	100	10	60
Lambsquarters	0	0	10	0	100	80	100
Morningglory	10	0	10	10	60	10	20
Pigweed	0	0	0	0	100	90	100
Rice	0	0	20	0	60	0	30
Surinam Grass	0	0	10	0	90	20	50
Velvetleaf	0	0	20	0	100	0	10

Table B							Compounds							
125 g ai/ha	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Preemergence														
Barnyardgrass	80	90	90	70	30	100	60	0	90	100	80	10	80	100
Cocklebur	30	–	20	0	0	90	0	0	40	60	0	0	0	–
Corn	50	80	20	0	0	70	0	0	20	0	0	0	0	30
Crabgrass, Large	100	100	100	80	70	100	90	0	70	80	100	0	90	100
Foxtail, Giant	100	100	100	60	20	100	80	0	60	70	90	10	60	100
Lambsquarters	100	100	90	100	60	100	100	0	100	100	100	0	90	100
Morningglory	60	30	20	0	0	40	10	0	–	10	0	0	20	20
Pigweed	100	100	100	100	90	100	100	0	100	100	90	0	100	100
Rice	70	70	40	30	0	90	70	0	70	60	50	0	50	90
Surinam Grass	70	90	80	50	20	100	30	0	70	50	50	0	70	100
Velvetleaf	60	100	90	90	50	100	60	0	70	100	10	0	50	90

Table B	Compounds													
125 g ai/ha	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Preemergence														
Barnyardgrass	30	100	80	50	10	10	10	0	0	0	0	0	100	80
Cocklebur	-	100	100	-	0	0	-	0	0	0	0	0	0	-
Corn	0	50	30	0	0	0	0	0	0	0	0	0	60	0
Crabgrass, Large	70	100	60	100	0	20	20	0	0	10	0	0	100	-
Foxtail, Giant	10	90	70	20	0	0	0	0	0	0	0	0	100	10
Lambsquarters	70	100	100	80	10	20	0	0	0	0	0	0	100	90
Morningglory	0	0	0	100	0	10	10	0	0	0	0	0	-	20
Pigweed	90	100	80	80	0	30	0	0	0	0	0	0	100	90
Rice	10	70	40	30	0	10	10	0	0	0	0	0	-	-
Surinam Grass	10	90	60	30	0	10	0	0	0	0	0	0	60	30
Velvetleaf	20	100	30	40	20	0	0	0	0	0	0	0	100	60

Table B	Compounds													
125 g ai/ha	29	30	31	32	33	34	35	36	37	40	41	43	44	45
Preemergence														
Barnyardgrass	70	80	80	20	60	50	40	30	10	0	40	100	100	100
Cocklebur	-	0	10	0	20	0	20	0	0	0	0	0	0	0
Corn	0	10	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	100	20	10	30	90	80	70	10	30	0	70	40	0	40
Foxtail, Giant	80	30	60	0	80	30	80	0	20	0	10	10	0	10
Lambsquarters	90	90	90	100	100	80	90	80	10	40	80	90	80	100
Morningglory	10	0	-	50	10	0	10	10	0	-	0	0	0	10
Pigweed	100	80	70	0	100	100	100	90	80	30	70	100	100	100
Surinam Grass	60	0	30	0	30	20	40	10	10	0	10	30	0	20
Velvetleaf	50	10	80	0	40	20	50	20	20	0	0	30	20	20

Table B	Compounds													
125 g ai/ha	46	47	48	49	50	51	52	55	56	57	58	59	60	61
Preemergence														
Barnyardgrass	60	70	70	30	40	80	10	80	50	50	90	10	50	20
Cocklebur	20	0	10	0	0	0	0	0	0	0	0	0	0	0
Corn	10	0	0	0	0	0	0	0	0	0	20	0	0	0
Crabgrass, Large	90	80	20	20	30	90	20	90	70	40	100	10	90	50
Foxtail, Giant	60	40	70	0	20	100	10	60	60	20	100	0	40	20
Lambsquarters	100	100	90	70	90	100	0	70	100	100	100	90	90	100
Morningglory	10	30	10	0	10	0	0	0	20	0	-	0	10	-

Pigweed	100	100	100	90	100	100	0	80	30	90	100	100	90	80
Rice	–	–	10	40	10	0	0	50	40	30	60	0	30	0
Surinam Grass	20	20	10	10	20	30	0	50	30	20	30	0	10	10
Velvetleaf	50	30	90	0	20	50	0	0	0	0	60	10	10	70

Table B							Compounds							
125 g ai/ha	62	63	64	65	66	67	68	69	70	71	75	76	77	78
Preemergence														
Barnyardgrass	20	60	50	50	0	0	0	0	40	0	50	80	0	0
Cocklebur	0	0	0	0	0	0	0	0	0	0	0	–	0	0
Corn	0	0	0	0	0	0	0	0	10	0	0	30	0	0
Crabgrass, Large	80	70	20	20	0	0	0	0	100	0	10	80	0	0
Foxtail, Giant	70	60	10	20	0	0	0	0	90	0	30	90	0	10
Lambsquarters	100	90	60	80	0	0	20	0	–	0	20	50	60	0
Morningglory	10	0	0	0	0	0	20	0	10	0	0	10	0	0
Pigweed	100	100	100	90	0	0	70	0	30	0	50	100	90	0
Rice	0	50	0	10	0	0	0	0	0	0	40	50	0	–
Surinam Grass	10	20	10	10	0	0	0	0	40	0	30	70	0	0
Velvetleaf	80	10	0	10	0	0	0	0	30	0	20	30	0	10

Table B							Compounds							
125 g ai/ha	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Preemergence														
Barnyardgrass	0	0	10	0	0	0	0	0	20	70	0	10	0	0
Cocklebur	0	0	0	0	–	0	0	0	0	0	0	0	–	0
Corn	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	0	0	0	0	0	0	0	0	90	90	0	10	–	0
Foxtail, Giant	10	20	10	0	0	0	0	0	10	70	0	10	10	0
Lambsquarters	0	0	0	0	0	0	0	0	70	100	0	0	0	0
Morningglory	0	0	10	0	0	0	0	0	0	0	0	0	0	0
Pigweed	0	0	30	0	0	0	0	0	40	100	0	10	0	0
Rice	–	–	0	0	0	0	0	0	0	20	0	0	0	0
Surinam Grass	0	0	0	0	0	0	0	0	0	20	0	0	–	0
Velvetleaf	10	20	0	0	0	0	0	0	0	40	0	0	–	0

Table B							Compounds							
125 g ai/ha	93	94	95	96	97	98	99	100	101	102	104	105	106	107
Preemergence														
Barnyardgrass	0	10	50	70	0	0	0	0	40	80	0	0	–	0
Cocklebur	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Corn	10	0	60	40	0	0	0	0	20	0	0	0	0	0
Crabgrass, Large	10	10	60	20	0	0	20	0	50	100	80	0	90	0
Foxtail, Giant	10	10	50	60	0	0	10	0	20	30	0	0	10	0
Lambsquarters	0	0	100	100	0	0	0	0	100	100	60	0	0	0
Morningglory	0	0	10	0	0	0	0	0	10	50	0	0	-	0
Pigweed	0	0	100	100	0	0	0	0	100	90	60	0	0	0
Rice	0	0	30	60	0	0	0	0	30	-	-	-	-	-
Surinam Grass	0	0	20	20	0	0	10	0	10	20	0	0	0	0
Velvetleaf	0	0	0	50	0	0	10	0	20	0	0	0	0	0

Table B	Compounds													
125 g ai/ha	108	109	110	112	113	114	115	117	118	119	120	121	122	123
Preemergence														
Barnyardgrass	80	80	10	50	60	50	80	60	10	0	0	0	80	0
Cocklebur	10	0	0	0	0	10	20	20	0	0	0	0	20	0
Corn	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	100	80	80	20	100	90	90	90	90	20	70	0	90	0
Foxtail, Giant	90	70	10	10	10	50	80	20	10	0	0	0	50	0
Lambsquarters	100	20	20	0	80	100	100	90	0	0	0	70	80	0
Morningglory	50	10	20	0	0	10	30	-	10	0	10	0	20	0
Pigweed	90	30	0	0	0	80	80	60	60	0	0	80	70	0
Surinam Grass	50	60	10	20	10	20	70	30	10	0	0	0	20	0
Velvetleaf	80	20	0	0	20	40	80	60	0	0	20	0	40	0

Table B	Compounds													
125 g ai/ha	124	125	126	127	128	130	131	132	133	134	135	136	137	138
Preemergence														
Barnyardgrass	0	0	40	20	80	10	70	10	10	50	40	90	10	10
Cocklebur	0	0	0	10	20	0	0	0	0	0	0	0	0	0
Corn	0	0	0	0	0	10	0	10	0	0	0	10	10	0
Crabgrass, Large	0	0	0	90	90	90	50	90	20	80	50	100	80	40
Foxtail, Giant	0	0	0	30	40	20	10	30	0	20	10	80	40	30
Lambsquarters	0	0	0	0	0	0	100	60	50	100	30	100	10	0
Morningglory	0	0	0	0	20	10	10	10	10	10	10	50	0	0
Pigweed	30	0	0	40	50	20	100	100	100	100	60	100	80	60
Rice	-	-	-	-	-	0	20	0	0	0	0	20	0	0
Surinam Grass	0	0	0	50	40	60	10	40	0	30	10	40	20	0
Velvetleaf	0	0	0	10	70	10	50	30	20	30	30	50	10	0

Table B	Compounds													
125 g ai/ha	139	140	141	142	143	144	145	146	147	148	149	150	151	153
Preemergence														
Barnyardgrass	80	20	0	70	0	90	70	40	70	0	80	30	0	60
Cocklebur	0	-	0	30	0	10	0	0	0	0	0	0	0	0
Corn	10	0	0	0	0	10	0	0	10	0	10	0	0	0
Crabgrass, Large	60	0	10	80	0	80	-	10	90	0	90	0	0	50
Foxtail, Giant	70	0	10	60	0	100	80	10	70	0	60	0	0	0
Lambsquarters	100	0	0	100	0	100	80	80	90	0	60	0	0	100
Morningglory	10	-	20	-	0	100	30	0	0	0	20	0	0	0
Pigweed	90	0	0	100	0	100	100	100	100	0	100	70	0	100
Rice	30	0	0	30	-	20	0	10	0	0	20	0	0	10
Surinam Grass	30	0	0	10	0	60	30	10	20	0	40	10	0	10
Velvetleaf	50	0	0	80	0	100	80	20	30	0	0	0	0	40

Table B	Compounds													
125 g ai/ha	154	155	156	157	158	159	160	161	162	163	164	165	166	167
Preemergence														
Barnyardgrass	10	60	100	0	70	70	70	50	100	60	0	0	0	0
Cocklebur	0	0	100	0	40	90	40	0	30	70	0	0	0	-
Corn	0	0	40	0	0	0	0	0	30	0	0	0	0	-
Crabgrass, Large	50	60	90	0	80	40	20	80	100	60	0	0	0	0
Foxtail, Giant	0	20	100	0	50	50	10	20	100	20	0	0	0	0
Lambsquarters	70	100	100	0	70	100	100	100	100	80	0	0	0	0
Morningglory	0	30	60	0	50	30	20	10	20	60	0	0	0	0
Pigweed	90	100	100	0	100	100	100	100	100	90	0	0	0	0
Rice	0	20	90	0	80	-	-	0	90	80	-	0	0	0
Surinam Grass	0	10	90	0	30	60	20	10	90	50	0	0	0	0
Velvetleaf	70	20	100	0	50	80	60	20	90	70	0	0	0	0

Table B	Compounds													
125 g ai/ha	168	169	170	171	179	180	181	182	183	184	185	186	187	188
Preemergence														
Barnyardgrass	70	0	0	0	0	0	30	20	20	0	0	0	70	80
Cocklebur	0	0	0	0	0	0	10	0	0	0	0	0	0	0
Corn	0	0	0	0	0	0	0	0	0	0	0	0	20	10
Crabgrass, Large	100	0	20	0	0	0	50	70	10	30	0	0	70	100
Foxtail, Giant	90	0	0	-	0	0	20	30	0	0	0	0	10	50

Lambsquarters	90	0	0	0	0	0	50	20	50	50	20	0	30	90
Morningglory	0	0	0	0	0	0	0	10	10	10	0	0	20	10
Pigweed	100	0	0	0	0	0	30	100	100	100	0	0	20	40
Rice	0	0	0	0	–	–	40	0	0	0	0	0	30	50
Surinam Grass	50	0	0	–	0	0	30	30	20	0	10	0	30	30
Velvetleaf	60	0	0	0	0	0	0	0	10	10	10	10	10	70

Table B	Compounds													
125 g ai/ha	189	190	193	194	195	196	197	198	199	200	201	202	203	204
Preemergence														
Barnyardgrass	0	0	90	0	40	0	0	40	20	0	0	20	0	0
Cocklebur	0	0	10	0	0	0	0	0	0	0	0	0	0	0
Corn	0	0	70	0	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	30	30	100	100	80	0	0	80	90	50	0	60	30	0
Foxtail, Giant	0	0	100	10	20	0	0	20	10	0	0	10	0	0
Lambsquarters	0	0	100	30	0	0	0	100	80	20	0	30	10	0
Morningglory	–	0	40	20	10	0	0	10	0	0	0	0	0	–
Pigweed	90	30	100	0	90	0	0	90	90	10	0	10	10	0
Rice	0	0	80	0	10	–	0	30	0	0	0	10	0	0
Surinam Grass	0	0	80	0	10	0	0	10	10	0	0	0	0	0
Velvetleaf	0	0	70	20	10	0	0	0	0	0	0	10	0	0

Table B	Compounds													
125 g ai/ha	205	206	207	209	210	211	212	213	214	215	216	217	218	219
Preemergence														
Barnyardgrass	50	10	80	50	70	10	80	10	0	10	0	0	0	0
Cocklebur	10	0	10	10	10	0	0	0	0	0	0	0	0	0
Corn	10	0	10	0	20	0	10	0	0	0	0	0	0	0
Crabgrass, Large	60	10	70	40	90	10	60	10	0	0	0	0	0	0
Foxtail, Giant	50	0	50	30	80	10	70	20	0	0	0	0	0	0
Lambsquarters	80	0	80	60	100	10	100	30	0	90	90	0	0	0
Morningglory	0	0	20	10	20	0	0	0	0	10	0	0	0	0
Pigweed	100	0	90	70	100	0	100	30	0	80	0	0	0	0
Rice	10	0	50	30	60	0	10	0	0	0	0	0	0	0
Surinam Grass	20	0	40	20	60	0	50	0	0	0	0	0	0	0
Velvetleaf	30	0	20	10	10	0	10	0	0	0	0	0	0	0

Table B	Compounds													
125 g ai/ha	220	221	222	223	224	225	226	227	228	229	230	231	232	233
Preemergence														
Barnyardgrass	0	0	90	20	30	60	10	0	80	50	10	50	30	10
Cocklebur	0	0	30	0	20	0	0	0	30	0	0	0	0	0
Corn	0	0	60	10	20	30	0	0	60	10	0	0	0	0
Crabgrass, Large	20	80	90	50	30	10	20	40	60	40	20	30	60	20
Foxtail, Giant	0	0	60	10	10	60	20	10	70	50	10	60	0	0
Lambsquarters	0	20	100	80	100	80	-	0	100	90	20	80	80	0
Morningglory	0	0	-	10	-	0	0	0	10	10	10	10	10	0
Pigweed	0	50	90	90	80	70	40	0	90	100	40	60	90	0
Rice	0	0	90	0	30	60	20	10	80	30	0	20	10	0
Surinam Grass	0	0	90	20	60	20	10	30	60	40	0	20	0	0
Velvetleaf	0	0	100	30	70	30	10	30	100	40	10	30	20	10

Table B	Compounds													
125 g ai/ha	234	235	236	237	238	239	240	241	242	243	244	245	246	247
Preemergence														
Barnyardgrass	0	10	50	20	0	0	0	0	80	70	80	70	60	30
Cocklebur	0	0	0	0	0	0	0	0	10	0	0	0	0	0
Corn	0	0	0	0	0	0	0	0	30	20	30	0	0	0
Crabgrass, Large	0	40	30	30	0	0	20	90	90	60	90	60	70	20
Foxtail, Giant	0	0	10	0	0	0	0	10	80	50	80	60	30	10
Lambsquarters	0	50	50	70	0	20	0	80	100	90	90	90	70	80
Morningglory	0	10	0	0	0	0	0	0	0	0	0	10	0	0
Pigweed	0	30	30	20	0	0	0	100	100	60	90	100	100	100
Rice	0	0	40	0	0	0	0	0	50	20	60	20	40	10
Surinam Grass	0	10	20	10	0	0	0	10	70	60	70	40	30	20
Velvetleaf	0	10	20	30	0	0	0	20	50	40	70	40	60	20

Table B	Compounds													
125 g ai/ha	248	249	250	252	253	254	256	257	258	259	260	261	262	263
Preemergence														
Barnyardgrass	0	0	0	0	0	0	0	0	70	0	0	0	0	10
Cocklebur	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Corn	0	0	0	0	0	0	0	0	0	0	0	-	0	0
Crabgrass, Large	20	0	0	80	20	10	10	0	10	0	0	50	0	10
Foxtail, Giant	30	0	0	10	0	0	0	0	0	0	0	0	0	0
Lambsquarters	0	0	0	-	0	-	-	0	-	0	-	-	40	70

Morningglory	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pigweed	0	0	0	-	-	0	-	0	0	0	-	0	50	80
Rice	0	0	0	30	0	0	30	0	20	0	0	0	0	0
Surinam Grass	20	0	10	10	10	0	60	0	0	0	0	0	0	10
Velvetleaf	0	0	0	0	0	0	0	0	0	0	0	0	0	10

Table B	Compounds													
125 g ai/ha	264	265	266	267	268	269	270	271	272	273	274	275	276	277
Preemergence														
Barnyardgrass	0	0	60	20	100	80	0	0	10	30	60	0	60	0
Cocklebur	0	0	0	0	80	20	0	0	0	0	0	0	0	0
Corn	0	0	0	0	80	60	0	0	0	0	0	0	20	0
Crabgrass, Large	10	-	50	40	100	100	0	0	80	80	10	0	10	0
Foxtail, Giant	0	0	80	30	100	80	0	0	30	50	10	0	30	0
Lambsquarters	0	-	100	0	100	100	-	0	100	70	70	-	40	40
Morningglory	0	0	0	20	0	10	0	0	0	0	0	0	0	0
Pigweed	0	0	100	-	100	100	0	0	90	70	30	0	30	60
Rice	0	0	70	20	90	70	0	0	0	0	30	0	50	0
Surinam Grass	0	0	60	10	80	50	0	0	10	20	50	0	10	0
Velvetleaf	0	0	20	20	100	60	50	0	10	10	20	0	0	0

Table B	Compounds													
125 g ai/ha	278	279	280	281	283	283	284	285	286	287	288	289	290	291
Preemergence														
Barnyardgrass	30	30	0	20	30	0	0	30	30	80	0	0	0	0
Cocklebur	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corn	0	0	0	0	0	-	0	0	0	0	0	0	0	0
Crabgrass, Large	20	10	0	10	10	0	0	20	0	70	0	0	0	0
Foxtail, Giant	20	10	0	10	10	0	0	10	10	10	0	0	10	0
Lambsquarters	100	100	-	90	100	0	90	100	100	100	0	0	100	0
Morningglory	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pigweed	100	90	70	100	100	0	90	100	100	90	0	0	0	0
Rice	30	20	0	20	10	0	0	40	30	80	0	0	0	0
Surinam Grass	20	0	0	10	0	0	0	10	10	50	0	0	0	0
Velvetleaf	0	0	10	10	10	0	0	30	0	70	0	0	0	0

Table B	Compounds													
125 g ai/ha	292	293	294	295	296	297	298	299	300	301	302	303	304	305
Preemergence														
Barnyardgrass	10	90	100	10	30	0	70	90	70	60	0	70	10	80

Cocklebur	0	60	90	0	0	0	0	20	10	0	0	0	0	50
Corn	0	70	80	0	30	0	30	50	0	0	0	–	0	10
Crabgrass, Large	80	100	100	10	40	20	100	100	100	100	70	100	10	90
Foxtail, Giant	0	60	90	10	70	10	80	100	80	70	0	50	10	80
Lambsquarters	70	80	100	0	90	0	100	100	100	100	0	100	100	100
Morningglory	0	40	0	0	10	10	10	40	10	10	0	10	10	0
Pigweed	40	10	100	0	70	0	100	100	100	100	100	100	100	100
Rice	0	90	90	10	–	0	40	80	40	10	0	70	0	70
Surinam Grass	20	90	100	0	20	10	80	100	80	90	10	50	10	80
Velvetleaf	30	100	100	50	70	0	10	100	90	100	0	10	90	80

Table B	Compounds													
125 g ai/ha	306	307	308	309	310	311	312	313	314	315	316	317	318	319
Preemergence														
Barnyardgrass	60	80	20	80	60	0	0	80	10	0	0	0	40	50
Cocklebur	0	80	0	30	10	0	0	0	0	0	0	0	0	0
Corn	70	70	20	60	40	0	0	10	0	0	0	0	0	10
Crabgrass, Large	100	90	40	60	90	0	0	30	20	0	0	0	10	50
Foxtail, Giant	40	90	10	80	50	0	0	40	30	0	0	0	0	20
Lambsquarters	100	100	100	90	100	0	0	100	20	0	0	0	90	20
Morningglory	10	0	0	0	0	0	0	10	0	0	0	0	0	10
Pigweed	100	100	80	70	80	0	0	100	90	20	0	0	90	60
Rice	60	80	20	70	40	–	–	20	0	0	0	0	0	30
Surinam Grass	30	70	20	60	30	0	0	30	20	0	0	0	0	20
Velvetleaf	30	100	50	80	60	0	0	30	20	10	0	0	20	0

Table B	Compounds													
125 g ai/ha	329	330	331	332	333	334	335	336	338	340	341	342	343	344
Preemergence														
Barnyardgrass	0	0	60	10	0	90	50	100	20	80	80	70	70	20
Cocklebur	0	0	0	0	0	60	0	10	0	20	40	40	–	20
Corn	0	0	20	0	0	20	30	50	10	–	–	–	–	10
Crabgrass, Large	0	0	60	40	40	90	50	90	80	80	90	40	40	60
Foxtail, Giant	0	0	20	20	10	90	60	60	30	60	50	40	30	10
Lambsquarters	0	0	–	90	40	100	0	90	60	90	100	80	90	90
Morningglory	0	0	0	10	0	0	0	20	0	30	–	10	50	10
Pigweed	0	0	40	100	90	60	0	100	70	100	90	80	90	90
Rice	0	0	30	20	0	–	–	–	–	–	–	–	–	–
Surinam Grass	0	0	40	10	10	80	30	90	20	80	100	50	50	30

Velvetleaf	0	0	20	30	10	100	40	30	–	70	60	70	100	40
Wheat	–	–	–	–	–	90	0	40	0	90	100	80	100	10

Table B	Compounds													
125 g ai/ha	345	346	347	348	349	350	351	352	353	354	355	356	357	358
Preemergence														
Barnyardgrass	20	0	0	0	80	0	0	70	40	0	70	60	30	70
Cocklebur	0	0	0	0	0	0	0	0	0	0	0	0	0	40
Corn	0	0	0	0	70	0	0	60	–	20	20	10	0	60
Crabgrass, Large	30	60	0	0	100	0	0	90	20	20	70	40	70	100
Foxtail, Giant	10	50	0	0	70	0	0	70	0	10	10	10	20	60
Lambsquarters	70	0	0	0	100	0	0	90	–	–	80	40	90	100
Morningglory	20	0	0	0	0	0	0	0	–	0	10	0	10	50
Pigweed	60	0	0	0	100	0	0	50	0	0	50	70	100	70
Rice	–	–	–	–	–	–	0	–	–	–	–	–	–	–
Surinam Grass	30	10	0	0	50	0	0	90	0	0	40	10	30	50
Velvetleaf	30	0	0	0	30	0	0	30	10	0	0	0	0	50
Wheat	0	–	0	0	80	0	–	10	0	0	10	0	40	40

Table B	Compounds							
125 g ai/ha	359	360	361	362	363	364	365	366
Preemergence								
Barnyardgrass	0	10	80	10	0	100	90	70
Cocklebur	0	0	0	0	0	70	10	0
Corn	0	10	30	0	0	80	90	40
Crabgrass, Large	90	40	80	20	20	100	100	40
Foxtail, Giant	60	50	50	10	20	100	100	50
Lambsquarters	0	0	80	0	0	100	100	–
Morningglory	0	0	10	0	0	70	50	30
Pigweed	0	20	80	0	0	100	100	70
Surinam Grass	20	20	50	10	0	100	70	30
Velvetleaf	0	20	20	0	0	100	50	0
Wheat	10	30	10	0	10	100	70	30

Table B	Compounds								
62 g ai/ha	54	72	73	74	129	152	191	192	251
Preemergence									
Barnyardgrass	0	0	0	0	10	50	0	20	0
Cocklebur	0	0	0	0	0	0	0	0	0
Corn	0	0	0	0	0	0	0	0	0

Crabgrass, Large	0	0	0	0	40	90	10	30	0
Foxtail, Giant	0	0	10	0	0	90	0	10	0
Lambsquarters	0	0	0	0	0	100	50	60	–
Morningglory	0	0	0	0	–	–	0	0	0
Pigweed	0	0	0	0	0	100	10	30	–
Rice	0	0	20	0	–	10	0	0	0
Surinam Grass	0	0	0	0	10	40	0	10	0
Velvetleaf	0	0	0	0	0	80	0	0	0

Table B	Compounds		
31 g ai/ha	49	168	346
Preemergence			
Barnyardgrass	0	0	0
Cocklebur	0	0	0
Corn	0	0	0
Crabgrass, Large	–	90	0
Foxtail, Giant	0	0	0
Lambsquarters	0	50	0
Morningglory	0	0	0
Pigweed	60	90	0
Rice	10	0	–
Surinam Grass	0	0	0
Velvetleaf	0	10	0
Wheat	–	–	0

Table B	Compound
16 g ai/ha	251
Preemergence	
Barnyardgrass	0
Cocklebur	0
Corn	0
Crabgrass, Large	0
Foxtail, Giant	0
Lambsquarters	0
Morningglory	0
Pigweed	0
Rice	0
Surinam Grass	0
Velvetleaf	0

<u>TEST C</u>

Seeds of plant species selected from bermudagrass (*Cynodon dactylon* (L.) Pers.), Surinam grass (*Urochloa decumbens* (Staph) R. D. Webster, previously named *Brachiaria decumbens* Stapf), cocklebur (*Xanthium strumarium* L.), corn (*Zea mays* L.), large crabgrass (*Digitaria sanguinalis* (L.) Scop.), woolly cupgrass (*Eriochloa villosa* (Thunb.) Kunth), giant foxtail (*Setaria faberi* Herrm.), goosegrass (*Eleusine indica* (L.) Gaertn.), johnsongrass (*Sorghum halepense* (L.) Pers.), kochia (*Kochia scoparia* (L.) Schrad.), lambsquarters (*Chenopodium album* L.), morningglory (*Ipomoea coccinea* L.), eastern black nightshade (*Solanum ptycanthum* Dunal), yellow nutsedge (*Cyperus esculentus* L.), pigweed (*Amaranthus retroflexus* L.), common ragweed (*Ambrosia elatior* L.), soybean (*Glycine max* (L.) Merr.), common (oilseed) sunflower (*Helianthus annuus* L.) and velvetleaf (*Abutilon theophrasti* Medik.) were planted and treated preemergence with test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant.

At the same time, plants selected from these crop and weed species and also winter barley (*Hordeum vulgare* L.), blackgrass (*Alopecurus myosuroides* Huds.), canarygrass (*Phalaris minor* Retz.), chickweed (*Stellaria media* (L.) Vill.), downy bromegrass (*Bromus tectorum* L.), green foxtail (*Setaria viridis* (L.) Beauv.), Italian ryegrass (*Lolium multiflorum* Lam.), wheat (*Triticum aestivum* L.), wild oat (*Avena fatua* L.) and windgrass (*Apera spica-venti* (L.) Beauv.) were treated with postemergence applications of some of the test chemicals formulated in the same manner. Plants ranged in height from 2 to 18 cm (1- to 4-leaf stage) for postemergence treatments. Plant species in the flooded paddy test consisted of rice (*Oryza sativa*), smallflower umbrella sedge (*Cyperus difformis* L.), ducksalad (*Heteranthera limosa* (Sw.) Willd.) and barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.) grown to the 2-leaf stage for testing. Treated plants and controls were maintained in a greenhouse for 12 to 14 days, after which time all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table C, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table C							Compounds							
500 g ai/ha	1	2	3	4	5	6	7	9	10	11	13	14	15	16
Flooded Paddy														
Barnyardgrass	75	90	60	80	10	90	90	70	80	90	90	95	75	95
Ducksalad	95	95	90	90	70	100	80	95	90	80	85	85	30	90
Rice	95	85	70	75	0	90	75	80	90	80	70	85	50	90
Sedge, Umbrella	–	95	90	95	70	90	80	–	85	80	90	95	70	90

Table C							Compounds							
500 g ai/ha	17	18	20	21	27	28	29	31	34	43	45	47	49	51
Flooded Paddy														
Barnyardgrass	80	85	15	70	85	60	85	75	65	50	80	40	80	75
Ducksalad	85	70	25	65	80	70	85	60	75	70	60	80	80	85
Rice	80	80	30	45	80	35	80	50	55	20	65	50	90	50
Sedge, Umbrella	85	85	80	50	80	25	90	55	90	80	80	80	80	80

Table C							Compounds							
500 g ai/ha	55	56	58	62	63	64	65	67	75	76	79	80	81	88
Flooded Paddy														
Barnyardgrass	75	80	85	55	50	35	60	25	70	90	80	60	30	45
Ducksalad	80	75	60	90	85	40	85	40	70	80	55	40	20	75
Rice	60	35	75	65	50	15	30	30	65	90	30	40	40	45
Sedge, Umbrella	80	90	65	85	90	75	80	75	85	90	85	70	80	80

Table C	Compounds													
500 g ai/ha	95	96	101	102	106	108	112	115	117	118	122	126	127	128
Flooded Paddy														
Barnyardgrass	60	80	50	70	0	70	30	75	50	50	80	25	55	65
Ducksalad	90	90	75	90	0	90	100	90	60	50	80	30	80	95
Rice	65	75	25	60	20	50	30	75	65	50	50	0	25	70
Sedge, Umbrella	95	95	90	80	80	80	50	95	80	50	80	50	85	95

Table C	Compounds													
500 g ai/ha	131	134	136	138	139	140	141	142	144	146	152	155	156	159
Flooded Paddy														
Barnyardgrass	30	50	80	30	65	15	10	90	60	20	85	65	35	80
Ducksalad	80	90	90	70	90	20	0	100	80	20	85	90	50	100
Rice	10	60	70	40	60	0	0	70	30	20	80	35	60	90
Sedge, Umbrella	80	85	85	95	85	65	45	90	90	90	85	75	80	80

Table C	Compounds													
500 g ai/ha	160	161	163	181	183	186	187	188	192	193	194	207	209	210
Flooded Paddy														
Barnyardgrass	85	75	90	0	0	70	75	85	70	90	35	85	80	85
Ducksalad	90	90	100	80	20	80	90	85	60	90	40	85	80	90
Rice	95	65	75	0	0	65	65	75	70	75	45	60	65	75
Sedge, Umbrella	85	40	–	85	50	85	85	85	90	85	75	90	80	90

Table C	Compounds													
500 g ai/ha	215	216	219	222	223	225	226	227	228	229	231	232	235	236
Flooded Paddy														
Barnyardgrass	50	30	0	95	45	90	60	0	95	80	80	15	0	40
Ducksalad	80	40	0	95	55	85	65	55	90	85	80	80	75	80
Rice	20	30	0	85	75	80	70	55	85	90	80	60	35	70
Sedge, Umbrella	90	50	20	90	85	80	70	15	85	80	75	85	80	55

Table C	Compounds													
500 g ai/ha	241	242	243	244	245	247	252	255	256	258	259	260	263	266
Flooded Paddy														
Barnyardgrass	30	95	85	80	70	0	45	35	0	45	0	35	0	70
Ducksalad	15	95	90	95	75	80	80	40	65	90	75	85	90	95
Rice	65	90	90	75	70	75	60	50	15	70	0	15	25	80
Sedge, Umbrella	85	85	80	85	70	75	75	45	60	80	70	65	50	80

Table C	Compounds													
500 g ai/ha	268	269	272	273	274	276	278	281	283	285	286	287	290	293
Flooded Paddy														
Barnyardgrass	95	90	30	70	60	70	25	65	10	75	80	25	40	80
Ducksalad	90	85	85	75	20	85	20	85	0	90	90	45	70	95
Rice	90	80	20	60	45	70	30	50	0	65	75	55	45	80
Sedge, Umbrella	95	85	75	75	75	85	75	90	0	65	90	75	70	90

Table C	Compounds													
500 g ai/ha	294	295	296	298	299	300	301	302	303	304	305	306	307	308
Flooded Paddy														
Barnyardgrass	100	40	65	90	95	95	95	35	95	95	100	70	95	65
Ducksalad	95	30	70	90	95	90	95	85	85	95	0	90	90	75
Rice	90	40	60	75	85	75	85	55	85	75	85	70	80	70
Sedge, Umbrella	90	80	85	80	95	90	95	85	90	95	90	90	85	80

Table C	Compounds													
500 g ai/ha	309	310	319	331	332	333	334	335	336	340	341	342	343	344
Flooded Paddy														
Barnyardgrass	90	90	65	65	60	30	95	65	80	70	60	60	80	0
Ducksalad	90	90	85	85	95	25	90	70	90	90	60	80	90	45
Rice	75	80	70	65	70	20	85	55	75	80	70	80	80	15
Sedge, Umbrella	80	85	80	65	85	80	95	95	90	90	60	80	90	85

Table C	Compounds					
500 g ai/ha	349	352	353	357	358	359
Flooded Paddy						
Barnyardgrass	95	90	20	55	85	75
Ducksalad	95	95	30	95	95	90
Rice	70	70	40	70	85	80
Sedge, Umbrella	95	95	50	95	85	95

Table C	Compounds													
250 g ai/ha	1	2	3	4	5	6	7	9	10	11	13	14	15	16
Flooded Paddy														
Barnyardgrass	65	75	20	65	0	90	75	65	70	70	80	90	25	90
Ducksalad	95	85	80	90	50	90	80	95	90	80	75	80	20	85
Rice	75	65	10	65	0	80	65	60	70	80	65	75	25	80
Sedge, Umbrella	-	85	90	85	60	90	80	-	75	70	80	90	55	90

Table C	Compounds													
250 g ai/ha	17	18	20	21	27	28	29	31	34	43	45	47	49	51
Flooded Paddy														
Barnyardgrass	75	65	0	15	60	35	60	70	45	40	60	40	70	20
Ducksalad	80	65	20	40	80	40	75	40	25	60	60	80	80	75
Rice	80	50	0	20	65	0	60	40	50	20	35	20	70	15
Sedge, Umbrella	80	80	50	30	80	20	60	40	80	70	80	80	80	65

Table C	Compounds													
250 g ai/ha	55	56	58	62	63	64	65	67	75	76	79	80	81	88
Flooded Paddy														
Barnyardgrass	25	65	35	30	20	0	30	10	65	80	25	40	0	15
Ducksalad	55	70	20	90	70	25	75	40	65	75	15	20	20	40
Rice	15	25	35	45	15	0	25	0	55	85	20	40	30	20
Sedge, Umbrella	75	90	50	80	80	35	75	75	80	85	80	70	80	80

Table C	Compounds													
250 g ai/ha	95	96	101	103	106	108	112	115	117	118	122	126	127	128
Flooded Paddy														
Barnyardgrass	55	70	30	50	0	60	10	65	50	20	60	20	30	60
Ducksalad	75	75	40	90	0	80	0	85	0	50	80	25	20	95
Rice	55	70	0	40	0	20	10	75	45	40	10	0	25	70
Sedge, Umbrella	95	90	80	70	30	80	25	90	75	50	70	20	80	95

Table C	Compounds													
250 g ai/ha	131	134	136	138	139	140	141	143	144	146	152	155	158	159
Flooded Paddy														
Barnyardgrass	10	50	40	15	55	0	0	80	50	0	75	50	15	70
Ducksalad	45	90	45	55	85	0	0	95	70	20	85	65	20	90
Rice	0	55	50	5	45	0	0	70	30	0	75	0	35	80
Sedge, Umbrella	70	85	85	75	85	45	30	80	80	90	85	65	70	60

Table C	Compounds													
250 g ai/ha	160	161	163	181	183	186	187	188	192	193	194	207	209	210
Flooded Paddy														
Barnyardgrass	70	30	75	0	0	45	60	75	0	85	0	75	70	85
Ducksalad	90	80	95	0	10	65	85	75	25	90	0	80	65	85
Rice	75	60	70	0	0	60	50	65	45	70	25	50	45	75
Sedge, Umbrella	80	25	75	80	10	80	80	80	85	80	35	75	65	85

Table C	Compounds													
250 g ai/ha	215	216	219	222	223	225	226	227	228	229	231	233	235	236
Flooded Paddy														
Barnyardgrass	40	0	0	90	0	80	50	0	95	75	75	0	0	15
Ducksalad	60	30	0	85	25	85	40	0	90	80	70	30	0	55
Rice	0	0	0	85	45	75	45	25	80	80	75	35	25	60
Sedge, Umbrella	70	30	0	85	65	75	40	0	80	80	65	55	55	45

Table C	Compounds													
250 g ai/ha	241	242	243	244	245	247	252	255	256	258	259	260	263	266
Flooded Paddy														
Barnyardgrass	0	90	75	75	45	0	15	25	0	15	0	20	0	50
Ducksalad	0	95	90	85	75	0	15	35	15	70	65	75	75	75
Rice	30	90	80	75	70	30	55	45	0	5	0	0	0	65
Sedge, Umbrella	55	85	80	70	70	15	50	35	60	70	55	65	30	55

Table C	Compounds													
250 g ai/ha	268	269	272	273	274	276	278	281	283	285	286	287	290	293
Flooded Paddy														
Barnyardgrass	95	75	10	60	30	50	0	30	0	55	70	0	25	70
Ducksalad	85	80	40	75	0	70	0	70	0	90	90	40	45	80
Rice	90	75	15	50	15	50	15	15	0	45	65	25	15	65
Sedge, Umbrella	80	80	75	75	70	80	65	40	0	50	90	70	65	80

Table C	Compounds													
250 g ai/ha	294	295	296	298	299	300	301	302	303	304	305	306	307	308
Flooded Paddy														
Barnyardgrass	95	25	50	65	95	90	90	10	80	85	95	55	80	25
Ducksalad	95	25	40	80	95	85	90	30	80	95	0	80	90	15
Rice	85	40	40	65	80	70	75	0	80	70	85	55	65	65
Sedge, Umbrella	90	80	75	70	95	85	90	75	85	95	90	90	80	70

Table C	Compounds													
250 g ai/ha	309	310	319	331	332	333	334	335	336	340	341	342	343	344
Flooded Paddy														
Barnyardgrass	85	70	50	40	50	10	95	40	60	60	50	50	60	0
Ducksalad	90	80	45	65	95	0	85	50	75	70	60	80	90	20
Rice	75	70	35	50	45	15	80	55	75	70	60	60	70	0
Sedge, Umbrella	80	85	70	25	85	30	90	90	85	70	60	70	80	75

Table C	Compounds					
250 g ai/ha	349	352	353	357	358	359
Flooded Paddy						
Barnyardgrass	90	65	20	30	75	75
Ducksalad	85	85	30	45	90	85
Rice	60	60	20	45	70	65
Sedge, Umbrella	90	90	50	90	85	90

Table C							Compounds							
125 g ai/ha	1	2	3	4	5	6	7	9	10	11	13	14	15	16
Flooded Paddy														
Barnyardgrass	60	75	0	50	0	90	50	50	65	20	55	80	0	80
Ducksalad	90	80	65	75	15	90	60	95	90	80	35	75	0	80
Rice	70	50	5	50	0	80	55	55	60	40	50	70	0	75
Sedge, Umbrella	80	75	65	75	15	90	80	-	70	60	75	80	10	85

Table C							Compounds							
125 g ai/ha	17	18	20	21	27	28	29	31	34	43	45	47	48	49
Flooded Paddy														
Barnyardgrass	65	20	0	0	35	0	25	30	35	0	30	0	0	60
Ducksalad	80	40	10	40	60	0	45	20	25	0	0	70	40	50
Rice	70	40	0	0	20	0	25	10	0	0	30	20	20	25
Sedge, Umbrella	45	60	15	25	70	15	60	35	80	50	60	70	60	45

Table C							Compounds							
125 g ai/ha	51	55	56	58	62	63	64	65	67	75	76	79	80	81
Flooded Paddy														
Barnyardgrass	0	0	20	10	10	0	0	0	0	25	70	25	20	0
Ducksalad	55	0	55	15	35	50	10	45	30	30	50	0	20	0
Rice	0	0	15	35	25	0	0	0	0	25	80	20	40	30
Sedge, Umbrella	50	20	85	20	60	70	25	20	50	75	85	75	70	70

Table C							Compounds							
125 g ai/ha	88	95	96	101	102	106	108	112	115	117	118	122	126	127
Flooded Paddy														
Barnyardgrass	0	45	45	20	50	0	40	0	45	30	20	50	0	30
Ducksalad	15	25	45	0	80	0	70	0	75	0	50	80	10	15
Rice	0	10	45	0	30	0	0	0	65	15	30	10	0	25
Sedge, Umbrella	50	90	80	75	70	0	80	0	85	55	50	60	20	80

Table C	Compounds													
125 g ai/ha	128	131	134	136	138	139	140	141	142	144	146	147	152	155
Flooded Paddy														
Barnyardgrass	35	0	25	25	0	40	0	0	65	20	0	0	75	25
Ducksalad	95	20	70	0	20	70	0	0	90	50	0	0	85	80
Rice	40	0	45	35	5	35	0	0	70	20	0	0	75	0
Sedge, Umbrella	90	65	75	80	40	80	20	0	80	80	80	50	80	30

Table C	Compounds													
125 g ai/ha	158	159	160	161	162	181	183	186	187	188	192	193	194	207
Flooded Paddy														
Barnyardgrass	0	50	60	0	65	0	0	30	25	55	0	55	0	65
Ducksalad	0	90	85	65	85	0	0	40	40	65	0	70	0	80
Rice	0	60	70	10	60	0	0	55	30	45	15	50	25	45
Sedge, Umbrella	45	40	70	0	-	20	0	80	65	75	75	75	0	75

Table C	Compounds													
125 g ai/ha	209	210	215	216	219	222	223	225	226	227	228	229	231	232
Flooded Paddy														
Barnyardgrass	55	70	0	0	0	75	0	60	0	0	85	45	45	0
Ducksalad	65	55	40	20	0	75	0	75	0	0	85	0	60	0
Rice	45	55	0	0	0	70	0	70	25	0	80	35	55	20
Sedge, Umbrella	55	80	40	30	0	75	0	75	10	0	80	40	55	35

Table C	Compounds													
125 g ai/ha	235	236	241	242	243	244	245	247	252	255	256	258	259	260
Flooded Paddy														
Barnyardgrass	0	0	0	75	65	70	35	0	0	10	0	0	0	0
Ducksalad	0	40	0	95	85	85	75	0	0	10	0	45	60	70
Rice	0	30	0	85	75	70	65	0	45	0	0	0	0	0
Sedge, Umbrella	50	20	0	75	80	65	70	0	40	20	0	20	35	40

Table C	Compounds													
125 g ai/ha	263	266	268	269	272	273	274	276	278	281	283	285	286	287
Flooded Paddy														
Barnyardgrass	0	25	90	65	0	40	10	15	0	20	0	25	55	0
Ducksalad	0	15	70	80	20	50	0	20	0	0	0	80	75	30
Rice	0	10	85	50	10	40	0	15	0	0	0	40	55	20
Sedge, Umbrella	0	20	70	80	65	75	50	75	25	20	0	35	70	35

Table C	Compounds													
125 g ai/ha	290	293	294	295	296	298	299	300	301	302	303	304	305	306
Flooded Paddy														
Barnyardgrass	0	20	90	15	25	50	85	50	75	0	45	50	85	45
Ducksalad	0	65	95	0	0	40	95	80	90	25	75	85	0	80
Rice	0	30	75	10	20	60	80	55	55	0	65	60	80	40
Sedge, Umbrella	25	75	85	80	75	0	95	80	90	50	85	90	90	90

Table C	Compounds													
125 g ai/ha	307	308	309	310	313	319	331	332	333	334	335	336	340	341
Flooded Paddy														
Barnyardgrass	65	0	60	50	0	25	10	25	0	90	25	0	50	20
Ducksalad	70	0	90	75	30	0	50	90	0	85	35	55	70	50
Rice	60	25	70	60	20	35	15	0	0	75	25	45	40	50
Sedge, Umbrella	70	25	80	85	70	35	20	80	15	90	85	80	70	50

Table C	Compounds								
125 g ai/ha	342	343	344	349	352	353	357	358	359
Flooded Paddy									
Barnyardgrass	20	20	0	70	45	0	0	60	55
Ducksalad	50	80	0	85	65	0	30	80	80
Rice	30	50	0	55	45	0	0	65	45
Sedge, Umbrella	50	40	75	85	75	0	85	85	90

Table C	Compounds													
62 g ai/ha	1	2	3	4	5	6	7	9	10	11	13	14	15	16
Flooded Paddy														
Barnyardgrass	50	15	0	20	0	60	10	35	25	0	25	65	0	80
Ducksalad	90	80	15	50	15	80	20	95	80	50	25	60	0	75
Rice	65	50	0	25	0	40	15	50	60	15	10	25	0	75
Sedge, Umbrella	60	75	45	75	0	70	55	–	45	20	50	65	0	80

Table C	Compounds													
62 g ai/ha	17	18	20	21	27	28	29	31	34	43	45	47	48	49
Flooded Paddy														
Barnyardgrass	50	0	0	0	30	0	10	0	0	0	25	0	0	45
Ducksalad	75	20	0	0	45	0	0	10	15	0	0	0	20	0
Rice	60	0	0	0	0	0	0	0	0	0	30	0	0	15
Sedge, Umbrella	40	15	0	0	50	0	20	0	50	30	55	30	60	45

Table C	Compounds													
62 g ai/ha	51	55	56	58	62	63	64	65	67	75	76	79	80	81
Flooded Paddy														
Barnyardgrass	0	0	0	0	5	0	0	0	0	0	50	10	0	0
Ducksalad	0	0	15	0	25	0	0	15	30	0	45	0	20	0
Rice	0	0	0	0	15	0	0	0	0	0	75	20	20	20
Sedge, Umbrella	45	0	45	0	45	0	0	0	50	70	80	75	70	70

Table C	Compounds													
62 g ai/ha	88	95	96	101	102	106	108	112	115	117	118	122	126	127
Flooded Paddy														
Barnyardgrass	0	20	45	0	10	0	30	0	30	10	0	20	0	20
Ducksalad	0	10	45	0	20	0	50	0	30	0	0	50	0	0
Rice	0	10	40	0	20	0	0	0	55	0	20	0	0	20
Sedge, Umbrella	0	85	90	20	50	0	60	0	80	40	0	50	0	80

Table C	Compounds													
62 g ai/ha	128	131	134	136	138	139	140	141	142	144	146	147	152	155
Flooded Paddy														
Barnyardgrass	30	0	10	20	0	15	0	0	50	20	0	0	40	0
Ducksalad	80	0	45	0	0	0	0	0	75	20	0	0	85	45
Rice	25	0	35	30	5	0	0	0	70	0	0	0	50	0
Sedge, Umbrella	80	55	55	65	0	75	0	0	75	80	60	30	80	0

Table C	Compounds													
62 g ai/ha	158	159	160	161	162	181	183	186	187	188	192	193	194	207
Flooded Paddy														
Barnyardgrass	0	30	20	0	45	0	0	20	0	35	0	30	0	45
Ducksalad	0	80	75	30	70	0	0	15	20	20	0	55	0	55
Rice	0	60	60	0	55	0	0	40	15	35	0	25	0	30
Sedge, Umbrella	15	10	50	0	70	10	0	80	20	30	70	75	0	70

Table C	Compounds													
62 g ai/ha	209	210	215	216	219	222	223	225	226	227	228	229	231	232
Flooded Paddy														
Barnyardgrass	0	50	0	0	0	15	0	35	0	0	80	40	40	0
Ducksalad	65	40	40	0	-	70	0	10	0	0	80	0	10	0
Rice	0	35	0	0	0	30	0	55	0	0	75	35	30	0
Sedge, Umbrella	55	75	40	20	0	65	0	65	10	0	80	30	10	0

Table C	Compounds													
62 g ai/ha	235	236	241	242	243	244	245	247	252	255	256	258	259	260
Flooded Paddy														
Barnyardgrass	0	0	0	15	0	0	0	0	0	0	0	0	0	0
Ducksalad	0	0	0	65	75	25	60	0	0	0	0	15	0	0
Rice	0	0	0	50	15	40	25	0	0	0	0	0	0	0
Sedge, Umbrella	0	0	0	45	75	20	55	0	0	0	0	0	0	0

Table C	Compounds													
62 g ai/ha	263	266	268	269	272	273	274	276	278	281	283	285	286	287
Flooded Paddy														
Barnyardgrass	0	0	65	45	0	20	0	0	0	0	0	10	40	0
Ducksalad	0	0	60	55	10	20	0	0	0	0	0	45	50	0
Rice	0	0	75	45	0	10	0	0	0	0	0	25	45	0
Sedge, Umbrella	0	0	55	45	30	70	0	45	0	15	0	25	30	0

Table C	Compounds													
62 g ai/ha	290	293	294	295	296	298	299	300	301	302	303	304	305	306
Flooded Paddy														
Barnyardgrass	0	0	75	0	15	15	85	35	50	0	30	40	70	0
Ducksalad	0	0	90	0	0	35	95	75	85	0	55	65	0	50
Rice	0	0	70	5	20	45	70	40	50	0	30	45	75	30
Sedge, Umbrella	0	20	80	80	75	0	85	80	80	15	75	75	85	85

Table C	Compounds													
62 g ai/ha	307	308	309	310	313	319	331	332	333	334	335	336	340	341
Flooded Paddy														
Barnyardgrass	30	0	50	35	0	0	0	5	0	70	10	0	20	30
Ducksalad	60	0	85	45	0	0	0	20	0	75	0	45	50	20
Rice	55	15	60	35	0	0	0	0	0	70	25	10	20	20
Sedge, Umbrella	40	0	80	35	30	20	0	65	0	80	45	25	50	20

Table C	Compounds								
62 g ai/ha	342	343	344	349	352	353	357	358	359
Flooded Paddy									
Barnyardgrass	20	20	0	45	25	0	0	0	15
Ducksalad	50	40	0	80	20	0	30	0	40
Rice	20	20	0	50	20	0	0	30	20
Sedge, Umbrella	40	20	0	80	50	0	40	15	80

Table C 31 g ai/ha	Compounds 48	147	313
Flooded Paddy			
Barnyardgrass	0	0	0
Ducksalad	0	0	0
Rice	0	0	0
Sedge, Umbrella	0	20	0

Table C 16 g ai/ha	Compounds 48	147	313
Flooded Paddy			
Barnyardgrass	0	0	0
Ducksalad	0	0	0
Rice	0	0	0
Sedge, Umbrella	0	0	0

Table C	Compounds													
500 g ai/ha	28	31	34	46	47	50	58	82	84	85	86	96	108	112
Postemergence														
Bermudagrass	40	40	50	-	60	40	10	10	-	70	100	5	80	30
Chickweed	100	-	100	100	100	0	85	100	70	100	100	100	-	100
Cocklebur	80	60	70	90	90	10	50	20	0	100	100	95	100	70
Corn	60	50	70	80	80	85	15	45	0	45	30	45	60	30
Crabgrass, Large	60	70	60	90	90	0	30	60	50	40	40	5	100	30
Cupgrass, Woolly	-	60	90	70	80	0	20	80	0	85	85	50	40	70
Foxtail, Giant	40	40	40	70	70	0	40	30	0	70	70	60	70	50
Goosegrass	50	40	40	80	80	-	30	10	10	60	85	5	70	30
Johnsongrass	70	30	80	90	90	0	10	10	0	80	30	50	90	60
Kochia	80	70	90	100	100	10	85	70	80	90	95	90	90	80
Lambsquarters	100	90	100	100	100	0	90	100	50	100	100	100	100	100
Morningglory	60	70	40	80	90	10	20	50	0	80	85	50	-	100
Nutsedge, Yellow	20	30	20	40	30	-	5	5	0	40	30	5	30	20
Pigweed	100	100	100	100	100	100	85	100	100	100	100	100	100	100
Ragweed	50	70	40	80	90	85	85	30	0	60	70	85	-	70
Soybean	80	80	80	100	100	100	90	40	20	95	95	100	60	60
Surinam Grass	60	50	70	50	70	-	25	40	10	80	85	60	50	60
Velvetleaf	80	70	70	80	90	100	60	75	0	85	85	95	90	90

Table C	Compounds													
500 g ai/ha	115	130	137	144	146	147	212	272	301	304	318	332	333	338
Postemergence														
Barley, Winter	-	-	30	40	-	-	-	35	40	45	-	40	-	40
Bermudagrass	100	90	-	-	-	-	50	100	-	-	80	70	5	5
Blackgrass	-	-	60	40	-	-	-	65	45	95	-	70	55	65
Bromegrass, Downy	-	-	40	40	-	-	-	65	40	50	-	65	45	45
Canarygrass	-	-	40	50	-	-	-	55	50	45	-	70	45	50
Chickweed	100	100	-	100	-	100	100	100	-	-	80	100	-	-

Cocklebur	100	100	-	70	20	20	70	95	-	-	100	15	-	5
Corn	40	50	-	30	30	15	40	20	-	-	25	5	5	10
Crabgrass, Large	90	90	-	100	85	60	20	95	-	-	50	70	10	15
Cupgrass, Woolly	70	80	-	50	30	30	40	65	-	-	20	10	10	0
Foxtail, Giant	80	30	-	70	10	45	60	75	-	-	10	20	10	10
Foxtail, Green	-	-	50	60	-	-	-	60	65	60	-	70	65	50
Goosegrass	70	60	-	20	0	5	30	80	-	-	5	60	15	10
Johnsongrass	100	40	-	-	0	10	35	55	-	-	0	5	0	0
Kochia	90	85	-	85	-	80	90	100	-	-	60	100	100	90
Lambsquarters	100	100	-	100	100	100	100	100	-	-	100	100	100	75
Morningglory	100	100	-	80	0	0	70	100	-	-	0	-	10	50
Nutsedge, Yellow	30	0	-	0	0	0	20	0	-	-	0	0	0	0
Oat, Wild	-	-	50	50	-	-	-	65	60	70	-	70	55	60
Pigweed	100	100	-	100	100	100	90	100	-	-	100	95	100	80
Ragweed	90	85	-	80	0	10	-	95	-	-	0	60	50	10
Ryegrass, Italian	-	-	60	50	-	-	-	60	65	50	-	70	55	60
Soybean	90	70	-	90	80	70	85	95	-	-	90	90	45	60
Surinam Grass	60	60	-	40	20	60	50	60	-	-	10	30	10	30
Velvetleaf	90	85	-	50	40	40	70	100	-	-	60	90	80	80
Wheat	-	-	40	30	-	-	-	35	40	40	-	35	55	45
Windgrass	-	-	60	70	-	-	-	85	40	45	-	75	80	-

Table C	Compound
500 g ai/ha	353
Postemergence	
Barley, Winter	25
Blackgrass	70
Bromegrass, Downy	35
Canarygrass	20
Foxtail, Green	30

Table C	Compound
500 g ai/ha	353
Postemergence	
Oat, Wild	60
Ryegrass, Italian	20
Wheat	35
Windgrass	10

Table C	Compounds													
250 g ai/ha	27	28	31	34	44	46	47	50	58	60	62	80	81	82
Postemergence														
Barley, Winter	10	-	-	-	-	-	-	-	-	-	10	-	-	-
Bermudagrass	30	30	20	50	-	-	-	30	10	5	-	100	20	0
Blackgrass	20	-	-	-	-	-	-	-	-	-	40	-	-	-
Bromegrass, Downy	20	-	-	-	-	-	-	-	-	-	30	-	-	-
Canarygrass	30	-	-	-	-	-	-	-	-	-	40	-	-	-

Chickweed	100	100	100	60	90	80	90	0	50	10	-	100	100	100
Cocklebur	80	60	40	50	70	70	70	10	20	10	-	100	60	5
Corn	50	40	40	50	80	80	80	85	5	0	-	70	40	10
Crabgrass, Large	40	40	60	60	90	90	-	0	15	5	-	90	30	0
Cupgrass, Woolly	70	40	40	80	60	70	70	0	20	5	-	90	5	80
Foxtail, Giant	40	30	30	40	50	60	60	0	20	5	-	80	20	10
Foxtail, Green	40	-	-	-	-	-	-	-	-	-	50	-	-	-
Goosegrass	50	50	40	40	50	50	60	90	10	5	-	80	10	10
Johnsongrass	40	60	30	70	40	-	90	0	5	0	-	90	5	5
Kochia	100	80	70	90	90	100	100	10	80	20	-	100	70	50
Lambsquarters	100	90	90	100	90	100	100	0	90	70	-	100	5	80
Morningglory	40	40	60	10	80	60	70	0	10	10	-	90	10	50
Nutsedge, Yellow	20	20	30	0	20	20	30	-	5	0	-	40	0	5
Oat, Wild	20	-	-	-	-	-	-	-	-	-	50	-	-	-
Pigweed	100	100	100	100	100	100	100	100	70	60	-	100	40	100
Ragweed	60	40	40	40	90	80	80	85	5	5	-	70	60	10
Ryegrass, Italian	20	-	-	-	-	-	-	-	-	-	40	-	-	-
Soybean	90	80	70	80	100	100	100	100	80	50	-	100	30	40
Surinam Grass	50	60	50	50	40	50	60	50	-	5	-	80	80	30
Velvetleaf	70	70	70	70	-	80	80	100	35	30	-	100	60	70
Wheat	20	-	-	-	-	-	-	-	-	-	10	-	-	-
Windgrass	30	-	-	-	-	-	-	-	-	-	50	-	-	-

Table C	Compounds													
250 g ai/ha	84	85	86	96	108	112	114	115	130	137	139	144	146	147
Postemergence														
Barley, Winter	-	-	-	-	-	-	-	-	-	20	-	30	-	-
Bermudagrass	0	-	30	5	60	30	90	60	90	-	0	-	0	70
Blackgrass	-	-	-	-	-	-	-	-	-	40	-	40	-	-
Bromegrass, Downy	-	-	-	-	-	-	-	-	-	20	-	40	-	-
Canarygrass	-	-	-	-	-	-	-	-	-	40	-	40	-	-
Chickweed	70	100	100	100	-	100	100	100	100	-	80	100	100	90
Cocklebur	0	100	100	90	100	60	30	100	90	-	10	70	10	5
Corn	0	35	20	35	50	-	40	-	45	-	10	20	10	10
Crabgrass, Large	0	10	10	5	70	30	100	70	30	-	0	100	50	10
Cupgrass, Woolly	0	80	80	30	40	60	70	70	60	-	5	50	30	10
Foxtail, Giant	0	50	50	45	-	50	10	60	15	-	10	50	0	0
Foxtail, Green	-	-	-	-	-	-	-	-	-	50	-	60	-	-
Goosegrass	5	60	80	5	70	30	70	70	60	-	5	10	0	5

Johnsongrass	0	20	10	50	70	50	70	80	30	–	0	10	0	10
Kochia	10	90	95	85	90	–	100	90	70	–	50	70	20	50
Lambsquarters	0	50	100	95	100	100	100	100	100	–	–	100	100	100
Morningglory	0	60	85	30	–	70	–	–	80	–	60	20	0	0
Nutsedge, Yellow	0	20	10	5	30	20	10	30	0	–	0	0	0	0
Oat, Wild	–	–	–	–	–	–	–	–	–	40	–	50	–	–
Pigweed	100	100	100	100	100	100	100	100	100	–	80	100	100	100
Ragweed	0	40	70	80	–	70	90	70	85	–	45	50	0	10
Ryegrass, Italian	–	–	–	–	–	–	–	–	–	40	–	40	–	–
Soybean	20	80	90	100	60	50	70	80	40	–	35	90	30	40
Surinam Grass	0	80	70	40	40	40	20	60	30	–	0	40	0	30
Velvetleaf	0	80	80	70	80	90	80	90	40	–	50	50	40	–
Wheat	–	–	–	–	–	–	–	–	–	30	–	30	–	–
Windgrass	–	–	–	–	–	–	–	–	–	50	–	60	–	–

Table C	Compounds												
250 g ai/ha	212	268	272	295	296	301	304	318	332	333	334	338	353
Postemergence													
Barley, Winter	–	30	35	35	45	30	35	–	40	55	30	35	20
Bermudagrass	10	–	100	0	–	–	–	–	50	5	–	0	–
Blackgrass	–	60	45	65	75	90	70	–	100	50	95	50	60
Bromegrass, Downy	–	40	60	45	45	40	40	–	50	45	45	40	30
Canarygrass	–	50	40	35	55	50	45	–	60	40	45	40	10
Chickweed	80	–	100	100	–	–	–	10	100	–	–	–	–
Cocklebur	70	–	60	10	–	–	–	10	10	80	–	5	–
Corn	40	–	15	15	–	–	–	10	5	5	–	10	–
Crabgrass, Large	20	–	80	35	–	–	–	30	50	5	–	10	–
Cupgrass, Woolly	30	–	60	15	–	–	–	10	10	5	–	0	–
Foxtail, Giant	50	–	60	40	–	–	–	5	15	10	–	10	–
Foxtail, Green	–	50	45	60	60	60	50	–	50	50	45	40	20
Goosegrass	25	–	75	50	–	–	–	5	15	10	–	10	–
Johnsongrass	35	–	45	5	–	–	–	0	5	0	–	0	–
Kochia	90	–	100	90	–	–	–	60	95	100	–	90	–
Lambsquarters	90	–	100	50	–	–	–	100	100	80	–	75	–
Morningglory	70	–	100	30	–	–	–	0	80	10	–	40	–
Nutsedge, Yellow	20	–	0	5	–	–	–	0	0	0	–	0	–
Oat, Wild	–	65	55	50	60	75	60	–	70	60	95	50	40
Pigweed	70	–	100	95	–	–	–	100	95	100	–	80	–
Ragweed	80	–	80	40	–	–	–	0	40	50	–	5	–

Ryegrass, Italian	-	40	45	65	65	45	50	-	70	50	45	50	15
Soybean	70	-	85	55	-	-	-	80	60	40	-	35	-
Surinam Grass	20	-	35	15	-	-	-	0	10	5	-	0	-
Velvetleaf	50	-	100	70	-	-	-	40	85	50	-	40	-
Wheat	-	25	35	45	40	55	40	-	35	50	75	35	30
Windgrass	-	100	-	65	65	35	40	-	65	50	75	-	10

Table C	Compounds													
125 g ai/ha	27	28	31	33	34	35	44	46	47	50	58	60	62	80
Postemergence														
Barley, Winter	10	-	-	-	-	-	-	-	-	-	-	-	10	-
Bermudagrass	30	10	20	30	40	20	90	100	-	30	5	0	-	100
Blackgrass	20	-	-	-	-	-	-	-	-	-	-	-	40	-
Bromegrass, Downy	20	-	-	-	-	-	-	-	-	-	-	-	20	-
Canarygrass	30	-	-	-	-	-	-	-	-	-	-	-	30	-
Chickweed	100	100	90	100	50	90	90	70	90	0	20	10	-	100
Cocklebur	70	60	40	70	20	70	70	70	70	10	20	10	-	90
Corn	40	40	40	40	30	40	70	80	70	80	5	0	-	70
Crabgrass, Large	30	30	60	50	40	40	90	90	-	0	5	0	-	-
Cupgrass, Woolly	60	30	30	60	60	60	60	60	60	0	5	5	-	90
Foxtail, Giant	40	20	30	30	40	40	30	60	60	0	5	5	-	80
Foxtail, Green	40	-	-	-	-	-	-	-	-	-	-	-	50	-
Goosegrass	30	30	30	40	40	50	40	50	60	30	5	0	-	80
Johnsongrass	40	60	20	90	70	70	30	60	30	0	0	0	-	90
Kochia	60	40	70	90	90	90	90	-	100	10	80	20	-	100
Lambsquarters	80	70	80	90	80	90	90	100	100	0	70	30	-	100
Morningglory	40	0	50	30	10	40	50	60	50	0	10	10	-	90
Nutsedge, Yellow	20	0	0	10	0	0	20	20	20	-	5	0	-	40
Oat, Wild	20	-	-	-	-	-	-	-	-	-	-	-	40	-
Pigweed	100	90	90	100	100	100	100	100	100	100	60	40	-	100
Ragweed	50	40	40	70	30	50	50	70	80	85	5	5	-	70
Ryegrass, Italian	10	-	-	-	-	-	-	-	-	-	-	-	20	-
Soybean	80	80	50	90	80	90	100	100	-	100	75	40	-	90
Surinam Grass	30	20	40	50	30	60	40	40	30	50	-	5	-	80
Velvetleaf	60	60	60	-	70	80	80	80	80	100	10	20	-	100
Wheat	20	-	-	-	-	-	-	-	-	-	-	-	10	-
Windgrass	30	-	-	-	-	-	-	-	-	-	-	-	40	-

Table C	Compounds													
125 g ai/ha	81	82	84	85	86	96	108	112	114	115	130	137	139	144
Postemergence														
Barley, Winter	-	-	-	-	-	-	-	-	-	-	-	20	-	20
Bermudagrass	0	0	-	65	-	0	30	0	90	60	85	-	0	0
Blackgrass	-	-	-	-	-	-	-	-	-	-	-	40	-	30
Bromegrass, Downy	-	-	-	-	-	-	-	-	-	-	-	20	-	40
Canarygrass	-	-	-	-	-	-	-	-	-	-	-	30	-	40
Chickweed	95	95	50	100	100	100	-	10	-	100	100	-	70	100
Cocklebur	55	5	0	80	95	10	80	30	30	90	30	-	10	40
Corn	40	10	0	30	20	30	50	20	30	40	45	-	10	20
Crabgrass, Large	10	0	0	5	-	0	70	10	100	70	-	-	0	10
Cupgrass, Woolly	5	60	0	50	70	30	40	30	70	70	50	-	0	30
Foxtail, Giant	10	0	0	20	20	20	50	50	-	40	10	-	0	10
Foxtail, Green	-	-	-	-	-	-	-	-	-	-	-	50	-	60
Goosegrass	5	10	0	40	60	5	40	20	60	60	20	-	0	5
Johnsongrass	0	0	0	10	-	50	50	20	70	50	10	-	0	0
Kochia	20	40	0	60	85	80	80	20	80	90	30	-	50	65
Lambsquarters	5	50	0	30	100	80	100	20	90	100	100	-	-	100
Morningglory	10	10	0	40	75	5	60	20	30	80	40	-	50	0
Nutsedge, Yellow	0	5	0	20	5	0	30	0	0	10	0	-	0	0
Oat, Wild	-	-	-	-	-	-	-	-	-	-	-	40	-	50
Pigweed	10	100	100	100	100	100	100	60	100	100	100	-	65	100
Ragweed	60	0	0	10	65	50	-	0	80	70	40	-	45	0
Ryegrass, Italian	-	-	-	-	-	-	-	-	-	-	-	40	-	20
Soybean	30	30	0	60	70	100	60	0	70	70	40	-	30	85
Surinam Grass	50	10	0	30	60	40	40	40	10	40	10	-	0	0
Velvetleaf	55	10	0	75	60	70	60	0	70	90	30	-	50	20
Wheat	-	-	-	-	-	-	-	-	-	-	-	30	-	30
Windgrass	-	-	-	-	-	-	-	-	-	-	-	50	-	60

Table C	Compounds													
125 g ai/ha	146	147	212	268	272	295	296	301	304	318	332	333	334	338
Postemergence														
Barley, Winter	-	-	-	15	35	35	40	30	35	-	35	45	30	30
Bermudagrass	-	-	0	-	80	0	-	-	-	-	10	0	-	0
Blackgrass	-	-	-	45	45	65	65	75	50	-	70	40	95	45
Bromegrass, Downy	-	-	-	30	55	45	35	40	40	-	40	-	35	35
Canarygrass	-	-	-	30	35	35	40	45	40	-	45	35	35	35

Chickweed	80	30	80	-	100	100	-	-	-	0	100	-	-	-
Cocklebur	5	5	60	-	60	5	-	-	-	5	10	5	-	0
Corn	5	5	35	-	15	10	-	-	-	10	0	5	-	0
Crabgrass, Large	0	0	10	-	80	30	-	-	-	0	-	5	-	5
Cupgrass, Woolly	10	0	5	-	40	15	-	-	-	0	5	0	-	0
Foxtail, Giant	0	0	20	-	45	35	-	-	-	0	10	5	-	5
Foxtail, Green	-	-	-	45	40	50	50	45	45	-	40	40	35	40
Goosegrass	0	0	10	-	65	20	-	-	-	0	15	10	-	5
Johnsongrass	0	-	30	-	40	5	-	-	-	0	5	0	-	0
Kochia	-	10	80	-	100	85	-	-	-	10	90	100	-	60
Lambsquarters	80	100	90	-	100	5	-	-	-	70	65	80	-	5
Morningglory	0	0	10	-	100	10	-	-	-	0	10	0	-	0
Nutsedge, Yellow	0	0	10	-	0	5	-	-	-	0	0	0	-	0
Oat, Wild	-	-	-	35	45	50	60	65	60	-	65	60	75	45
Pigweed	90	90	-	-	100	-	-	-	-	100	90	100	-	5
Ragweed	0	0	60	-	65	30	-	-	-	0	30	30	-	5
Ryegrass, Italian	-	-	-	30	45	40	45	45	50	-	60	35	35	30
Soybean	20	35	60	-	80	50	-	-	-	70	50	30	-	30
Surinam Grass	0	0	5	-	10	5	-	-	-	0	5	5	-	0
Velvetleaf	35	30	-	-	95	65	-	-	-	35	60	50	-	0
Wheat	-	-	-	0	35	45	35	45	40	-	30	50	75	25
Windgrass	-	-	-	60	70	60	50	35	35	-	60	25	60	15

Table C	Compound
125 g ai/ha	353
Postemergence	
Barley, Winter	15
Blackgrass	20
Bromegrass, Downy	20
Canarygrass	10
Foxtail, Green	20

Table C	Compound
125 g ai/ha	353
Postemergence	
Oat, Wild	30
Ryegrass, Italian	15
Wheat	15
Windgrass	10

Table C	Compounds													
62 g ai/ha	27	28	31	33	34	35	44	46	47	50	58	60	62	80
Postemergence														
Barley, Winter	10	-	-	-	-	-	-	-	-	-	-	-	10	-
Bermudagrass	30	10	10	30	10	0	-	-	60	0	0	0	-	-
Blackgrass	10	-	-	-	-	-	-	-	-	-	-	-	40	-
Bromegrass, Downy	10	-	-	-	-	-	-	-	-	-	-	-	20	-

Canarygrass	20	-	-	-	-	-	-	-	-	-	-	-	0	-
Chickweed	70	90	90	90	-	80	90	70	90	0	20	5	-	100
Cocklebur	50	40	40	50	20	60	50	60	50	10	15	10	-	90
Corn	30	20	40	40	20	30	70	80	70	20	0	0	-	70
Crabgrass, Large	20	30	50	-	20	40	60	-	90	0	5	0	-	90
Cupgrass, Woolly	60	30	30	60	40	40	50	40	60	0	5	0	-	80
Foxtail, Giant	20	20	20	30	20	40	30	40	60	0	0	0	-	70
Foxtail, Green	30	-	-	-	-	-	-	-	-	-	-	-	40	-
Goosegrass	30	20	30	40	30	40	40	40	50	30	0	0	-	80
Johnsongrass	40	20	20	90	70	70	30	60	30	0	0	0	-	80
Kochia	60	40	70	90	80	90	90	90	100	0	75	10	-	100
Lambsquarters	70	70	80	90	40	90	90	80	90	0	60	10	-	90
Morningglory	40	0	50	20	10	20	50	60	50	0	10	10	-	90
Nutsedge, Yellow	20	0	0	0	0	0	20	20	20	-	0	0	-	40
Oat, Wild	20	-	-	-	-	-	-	-	-	-	-	-	30	-
Pigweed	90	90	90	100	100	100	100	100	100	50	60	40	-	100
Ragweed	30	30	30	60	20	50	50	70	70	80	0	0	-	70
Ryegrass, Italian	10	-	-	-	-	-	-	-	-	-	-	-	20	-
Soybean	80	70	30	80	70	90	100	100	100	100	15	20	-	90
Surinam Grass	20	-	30	50	30	40	40	40	30	10	-	5	-	80
Velvetleaf	60	50	50	90	20	70	60	50	80	100	10	20	-	100
Wheat	10	-	-	-	-	-	-	-	-	-	-	-	10	-
Windgrass	20	-	-	-	-	-	-	-	-	-	-	-	30	-

Table C	Compounds													
62 g ai/ha	81	82	84	85	86	96	108	112	114	115	137	139	144	146
Postemergence														
Barley, Winter	-	-	-	-	-	-	-	-	-	-	10	-	0	-
Bermudagrass	0	0	-	0	10	0	30	0	60	10	-	0	0	-
Blackgrass	-	-	-	-	-	-	-	-	-	-	40	-	30	-
Bromegrass, Downy	-	-	-	-	-	-	-	-	-	-	10	-	20	-
Canarygrass	-	-	-	-	-	-	-	-	-	-	20	-	40	-
Chickweed	95	70	0	100	100	100	-	0	100	100	-	0	100	10
Cocklebur	55	5	0	20	85	5	70	0	30	90	-	5	10	5
Corn	40	10	0	30	15	30	50	10	30	40	-	0	10	5
Crabgrass, Large	5	0	0	0	10	0	10	0	20	60	-	0	0	0
Cupgrass, Woolly	5	-	0	40	50	5	20	0	70	50	-	0	0	10
Foxtail, Giant	10	0	0	10	10	10	30	30	10	40	-	0	0	0
Foxtail, Green	-	-	-	-	-	-	-	-	-	-	30	-	40	-

Goosegrass	0	0	0	35	50	5	20	20	60	40	–	0	5	0
Johnsongrass	0	0	0	10	10	0	20	20	70	30	–	0	0	0
Kochia	0	10	0	30	80	80	60	0	80	80	–	50	–	5
Lambsquarters	5	30	0	10	100	60	70	20	90	100	–	–	100	40
Morningglory	10	10	0	10	10	0	30	0	10	50	–	0	0	0
Nutsedge, Yellow	0	0	0	10	0	0	20	0	0	0	–	0	0	0
Oat, Wild	–	–	–	–	–	–	–	–	–	–	20	–	30	–
Pigweed	5	85	100	100	100	70	60	10	100	100	–	50	100	80
Ragweed	40	0	0	10	10	50	–	0	60	70	–	0	0	0
Ryegrass, Italian	–	–	–	–	–	–	–	–	–	–	20	–	20	–
Soybean	10	20	0	55	45	100	50	0	70	60	–	20	70	20
Surinam Grass	50	10	0	25	10	0	20	20	10	30	–	0	0	0
Velvetleaf	55	5	0	60	40	40	40	0	60	60	–	30	0	30
Wheat	–	–	–	–	–	–	–	–	–	–	30	–	20	–
Windgrass	–	–	–	–	–	–	–	–	–	–	30	–	50	–

Table C							Compounds							
62 g ai/ha	147	312	268	272	295	296	301	304	318	332	333	334	338	353
Postemergence														
Barley, Winter	–	–	0	35	35	35	30	35	–	35	40	30	20	5
Bermudagrass	–	0	–	50	0	–	–	–	–	5	0	–	0	–
Blackgrass	–	–	30	35	45	60	55	60	–	60	30	90	40	0
Bromegrass, Downy	–	–	10	30	45	35	40	40	–	35	40	30	30	10
Canarygrass	–	–	10	35	30	30	35	40	–	35	35	25	20	0
Chickweed	5	60	–	95	100	–	–	–	0	60	–	–	–	–
Cocklebur	0	10	–	15	5	–	–	–	0	5	0	–	0	–
Corn	0	15	–	10	5	–	–	–	0	0	5	–	0	–
Crabgrass, Large	0	0	–	40	–	–	–	–	0	30	0	–	0	–
Cupgrass, Woolly	0	5	–	25	10	–	–	–	0	5	0	–	0	–
Foxtail, Giant	0	10	–	15	30	–	–	–	0	10	5	–	5	–
Foxtail, Green	–	–	40	35	45	40	40	40	–	35	30	35	30	15
Goosegrass	0	10	–	20	20	–	–	–	0	10	5	–	0	–
Johnsongrass	0	0	–	10	5	–	–	–	0	0	0	–	0	–
Kochia	5	80	–	95	80	–	–	–	0	80	90	–	50	–
Lambsquarters	90	80	–	100	0	–	–	–	60	50	60	–	0	–
Morningglory	0	10	–	80	10	–	–	–	0	5	0	–	0	–
Nutsedge, Yellow	0	0	–	0	5	–	–	–	0	0	0	–	0	–
Oat, Wild	–	–	20	40	50	35	45	60	–	50	50	55	40	10
Pigweed	90	50	–	100	80	–	–	–	100	85	65	–	0	–

Ragweed	0	60	-	60	25	-	-	-	0	5	5	-	0	-
Ryegrass, Italian	-	-	10	30	40	35	35	50	-	60	35	30	25	10
Soybean	10	50	-	60	50	-	-	-	65	45	30	-	10	-
Surinam Grass	0	0	-	5	5	-	-	-	0	5	5	-	0	-
Velvetleaf	0	0	-	85	60	-	-	-	0	40	-	-	0	-
Wheat	-	-	0	30	45	35	40	35	-	30	40	65	25	10
Windgrass	-	-	30	60	50	45	35	35	-	35	20	60	10	0

Table C						Compounds							
31 g ai/ha	27	33	35	60	62	80	81	114	139	268	295	296	334
Postemergence													
Barley, Winter	0	-	-	-	0	-	-	-	-	0	35	30	20
Bermudagrass	20	20	-	0	-	-	0	20	0	-	0	-	-
Blackgrass	10	-	-	-	20	-	-	-	-	0	45	45	75
Bromegrass, Downy	10	-	-	-	10	-	-	-	-	0	45	25	20
Canarygrass	10	-	-	-	0	-	-	-	-	10	25	30	20
Chickweed	70	40	70	5	-	90	90	80	0	-	85	-	-
Cocklebur	40	-	20	10	-	70	50	30	5	-	5	-	-
Corn	30	40	30	0	-	70	15	30	0	-	5	-	-
Crabgrass, Large	20	40	0	0	-	90	5	20	0	-	20	-	-
Cupgrass, Woolly	0	50	30	0	-	80	5	40	0	-	10	-	-
Foxtail, Giant	20	30	10	0	-	70	10	0	0	-	30	-	-
Foxtail, Green	30	-	-	-	40	-	-	-	-	35	40	40	30
Goosegrass	30	40	30	0	-	80	0	50	0	-	5	-	-
Johnsongrass	30	70	60	0	-	80	0	70	0	-	0	-	-
Kochia	50	60	-	5	-	100	0	30	20	-	50	-	-
Lambsquarters	60	90	70	10	-	90	0	80	-	-	0	-	-
Morningglory	30	20	10	10	-	80	5	0	0	-	5	-	-
Nutsedge, Yellow	20	0	0	0	-	40	0	0	0	-	0	-	-
Oat, Wild	20	-	-	-	30	-	-	-	-	30	45	35	40
Pigweed	80	90	100	20	-	100	0	90	50	-	60	-	-
Ragweed	30	-	20	0	-	70	0	60	0	-	20	-	-
Ryegrass, Italian	10	-	-	-	0	-	-	-	-	0	40	25	20
Soybean	80	80	90	30	-	90	5	20	20	-	35	-	-
Surinam Grass	30	50	10	0	-	80	50	10	0	-	5	-	-
Velvetleaf	50	60	50	15	-	100	5	30	0	-	60	-	-
Wheat	10	-	-	-	0	-	-	-	-	0	40	30	35
Windgrass	20	-	-	-	0	-	-	-	-	20	50	45	60

Table C 16 g ai/ha Postemergence	33	35
Bermudagrass	0	0
Chickweed	30	70
Cocklebur	20	20
Corn	40	30
Crabgrass, Large	-	0
Cupgrass, Woolly	30	20
Foxtail, Giant	30	0
Goosegrass	30	0
Johnsongrass	70	50

Table C 16 g ai/ha Postemergence	33	35
Kochia	60	20
Lambsquarters	70	50
Morningglory	0	0
Nutsedge, Yellow	0	0
Pigweed	90	70
Ragweed	50	20
Soybean	70	60
Surinam Grass	20	0
Velvetleaf	40	40

Table C	Compounds													
500 g ai/ha	1	2	3	6	7	9	10	11	13	14	16	28	30	31
Preemergence														
Bermudagrass	100	95	95	90	100	90	100	90	100	100	100	100	90	100
Cocklebur	100	80	40	100	-	100	-	-	20	90	75	30	20	-
Corn	80	60	35	80	80	65	60	80	75	95	80	0	-	-
Crabgrass, Large	100	100	95	100	100	95	100	100	100	100	100	100	100	100
Cupgrass, Woolly	65	80	70	75	-	30	85	70	70	100	85	20	60	60
Foxtail, Giant	80	100	100	100	100	75	100	90	100	100	100	100	90	100
Goosegrass	95	100	95	100	90	85	85	90	100	100	95	100	80	90
Johnsongrass	90	100	100	100	100	80	100	95	100	100	100	100	90	90
Kochia	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Lambsquarters	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Morningglory	100	100	60	70	0	35	60	15	100	100	70	60	80	40
Nightshade	100	100	95	100	100	100	100	100	100	100	100	100	100	100
Nutsedge, Yellow	80	-	70	85	60	60	60	60	75	90	90	20	-	0
Pigweed	100	100	95	100	100	100	100	100	100	100	100	100	100	100
Ragweed	100	100	100	100	100	100	100	100	100	100	100	90	20	80
Soybean	65	100	85	100	80	55	70	90	75	95	95	80	30	20
Sunflower	35	0	0	100	0	30	40	10	80	100	90	0	30	20
Surinam Grass	100	100	100	100	80	80	90	100	100	100	100	90	50	60
Velvetleaf	100	100	100	100	100	100	80	100	100	100	100	100	90	100

Table C	Compounds													
500 g ai/ha	34	46	47	48	50	55	56	57	58	61	63	64	65	88
Preemergence														
Bermudagrass	100	100	100	95	10	100	95	100	100	95	100	90	95	95
Cocklebur	0	90	100	10	80	0	0	0	30	0	0	0	0	0
Corn	0	10	10	0	10	0	0	0	0	0	30	30	20	60
Crabgrass, Large	100	100	100	90	80	100	100	100	95	100	100	90	100	100
Cupgrass, Woolly	70	80	80	20	70	65	40	70	80	10	5	10	10	90
Foxtail, Giant	100	100	90	50	10	100	100	100	100	60	80	80	60	100
Goosegrass	100	100	100	90	100	95	95	90	95	95	90	70	80	100
Johnsongrass	100	100	100	85	0	100	90	85	100	60	100	60	100	70
Kochia	100	100	40	100	100	100	95	100	100	100	90	60	90	100
Lambsquarters	100	100	100	95	100	100	100	100	100	100	100	90	100	100
Morningglory	100	90	90	20	0	75	55	25	80	100	40	0	10	20
Nightshade	100	100	100	100	95	95	95	100	100	90	95	95	100	95
Nutsedge, Yellow	0	0	0	30	80	10	30	20	50	30	40	0	0	0
Pigweed	100	100	100	100	95	95	100	100	100	95	100	100	100	100
Ragweed	40	90	100	100	100	80	95	100	100	80	95	20	60	20
Soybean	0	10	20	30	0	20	15	60	40	10	70	60	20	10
Sunflower	0	10	40	0	0	0	0	0	0	0	30	0	0	0
Surinam Grass	70	80	80	60	85	100	75	75	100	5	60	50	50	95
Velvetleaf	100	100	100	70	5	100	100	100	100	100	100	60	60	50

Table C	Compounds													
500 g ai/ha	96	102	108	115	130	134	137	140	144	145	146	147	149	152
Preemergence														
Bermudagrass	100	100	100	100	100	100	100	85	90	90	90	95	95	100
Cocklebur	90	70	50	100	100	0	0	0	80	0	0	0	0	100
Corn	40	30	50	30	10	60	5	0	50	20	30	60	10	70
Crabgrass, Large	100	100	100	100	95	100	100	100	100	80	70	100	100	100
Cupgrass, Woolly	70	40	80	90	70	45	40	45	70	40	0	60	70	100
Foxtail, Giant	100	80	100	100	95	85	85	85	100	70	80	100	100	100
Goosegrass	95	100	100	100	50	95	100	75	80	80	60	80	90	100
Johnsongrass	95	100	100	100	80	65	40	75	90	90	70	80	100	100
Kochia	100	60	100	100	100	100	100	100	100	80	100	100	90	100
Lambsquarters	-	100	100	100	80	100	100	100	100	100	100	100	95	100
Morningglory	100	80	90	80	30	75	60	0	90	30	50	0	60	100
Nightshade	100	100	100	100	60	100	90	95	100	90	100	100	95	100
Nutsedge, Yellow	10	30	80	20	0	0	0	0	40	0	0	0	0	70

Pigweed	100	100	100	100	100	100	100	100	100	95	100	100	100	100
Ragweed	100	100	90	100	80	100	100	95	80	20	70	70	5	100
Soybean	50	20	10	0	10	35	10	0	80	60	0	5	0	100
Sunflower	35	20	20	10	0	0	0	0	40	30	0	0	0	70
Surinam Grass	65	50	90	90	60	75	60	70	70	70	50	60	85	100
Velvetleaf	100	60	100	100	100	100	100	20	100	100	100	90	60	100

Table C	Compounds													
500 g ai/ha	153	156	162	182	188	193	195	198	199	202	205	207	210	212
Preemergence														
Bermudagrass	100	95	40	95	100	100	65	100	100	100	100	100	100	100
Cocklebur	0	100	75	0	0	100	0	10	0	20	0	0	5	95
Corn	0	50	75	0	5	100	0	0	0	10	40	20	40	40
Crabgrass, Large	80	100	100	100	100	100	70	95	95	95	100	100	100	100
Cupgrass, Woolly	60	90	100	0	75	70	10	70	70	60	50	40	10	30
Foxtail, Giant	0	95	75	60	100	100	20	100	100	100	95	100	60	95
Goosegrass	95	95	80	80	90	95	100	100	95	95	95	100	95	100
Johnsongrass	85	100	95	75	75	100	0	95	90	75	85	50	70	60
Kochia	100	100	100	90	95	100	85	100	90	95	90	95	95	95
Lambsquarters	100	100	100	95	100	100	95	100	100	100	100	95	100	100
Morningglory	15	100	100	100	75	100	0	85	70	85	50	0	10	30
Nightshade	100	100	100	95	100	100	0	100	100	100	100	100	100	100
Nutsedge, Yellow	45	85	60	0	0	60	70	5	0	0	10	20	30	0
Pigweed	100	100	100	95	100	100	90	100	100	100	100	100	100	100
Ragweed	100	100	100	65	100	100	90	100	80	95	100	100	90	95
Soybean	15	100	100	15	0	100	0	25	30	30	60	0	0	60
Sunflower	0	85	90	0	0	50	10	20	0	10	0	0	0	0
Surinam Grass	100	95	95	85	80	100	85	100	75	60	85	10	50	20
Velvetleaf	100	100	100	100	75	100	100	100	85	100	100	60	80	100

Table C	Compounds													
500 g ai/ha	213	215	221	222	223	242	244	268	269	287	293	294	298	299
Preemergence														
Bermudagrass	90	100	85	100	100	100	100	100	100	95	100	90	95	100
Cocklebur	100	60	-	100	0	50	0	85	50	60	60	85	0	95
Corn	40	50	10	100	50	25	45	70	55	-	95	80	30	60
Crabgrass, Large	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Cupgrass, Woolly	30	50	10	100	80	100	95	95	85	35	100	85	60	100
Foxtail, Giant	100	100	90	100	100	100	100	100	100	100	100	90	100	100

Goosegrass	90	100	50	100	100	100	100	100	100	100	100	100	100	100
Johnsongrass	80	85	80	100	-	100	100	100	100	95	100	100	90	100
Kochia	100	100	100	100	100	-	-	100	100	100	100	100	100	100
Lambsquarters	100	100	100	100	100	-	-	100	100	100	100	100	100	100
Morningglory	0	40	0	100	100	15	55	5	40	-	-	50	45	100
Nightshade	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Nutsedge, Yellow	0	0	0	60	0	25	0	70	60	85	20	90	30	80
Pigweed	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ragweed	0	100	60	100	100	100	100	100	90	100	100	100	0	100
Soybean	0	0	20	100	90	75	15	95	60	95	100	100	60	95
Sunflower	0	0	30	30	30	95	20	90	15	100	-	100	0	100
Surinam Grass	60	50	45	100	85	100	100	100	95	95	100	100	70	100
Velvetleaf	0	100	80	100	100	100	100	100	80	100	100	100	100	100

Table C	Compounds													
500 g ai/ha	301	304	305	306	307	309	310	314	318	332	333	336	340	341
Preemergence														
Bermudagrass	95	100	100	100	100	100	100	90	95	100	100	100	100	100
Cocklebur	60	0	90	5	75	60	30	20	0	0	5	50	40	100
Corn	45	30	45	50	45	60	10	0	40	5	0	85	50	90
Crabgrass, Large	100	100	100	100	100	100	100	60	100	100	100	100	100	100
Cupgrass, Woolly	90	80	70	50	85	100	-	20	10	10	30	85	75	100
Foxtail, Giant	100	90	100	100	100	100	100	70	80	90	75	90	85	80
Goosegrass	100	100	95	100	100	100	95	85	90	100	100	100	90	90
Johnsongrass	95	80	95	-	100	100	80	90	95	80	5	100	90	100
Kochia	100	100	100	100	100	100	100	70	100	100	100	100	100	100
Lambsquarters	100	100	100	100	100	100	100	85	100	100	100	100	100	100
Morningglory	60	10	10	20	15	40	10	40	85	0	10	100	50	50
Nightshade	100	100	100	100	100	100	100	100	95	100	100	100	100	100
Nutsedge, Yellow	20	5	50	40	50	60	15	0	0	0	0	60	60	60
Pigweed	100	100	100	100	100	100	100	90	100	100	100	100	100	100
Ragweed	70	70	100	100	100	100	80	60	70	70	65	100	75	100
Soybean	45	20	100	40	100	80	-	40	40	10	0	100	10	100
Sunflower	0	5	50	0	60	60	0	45	0	0	0	45	5	100
Surinam Grass	90	85	60	95	90	100	50	20	60	15	20	100	85	100
Velvetleaf	100	60	100	10	100	100	100	85	100	70	55	100	100	100

Table C	Compounds		
500 g ai/ha	342	343	352
Preemergence			
Bermudagrass	90	90	100
Cocklebur	100	100	30
Corn	90	80	50
Crabgrass, Large	85	100	100
Cupgrass, Woolly	70	100	85
Foxtail, Giant	70	80	100
Goosegrass	90	85	100
Johnsongrass	100	100	100
Kochia	100	100	100
Lambsquarters	100	100	100
Morningglory	100	100	60
Nightshade	85	95	100
Nutsedge, Yellow	60	90	50
Pigweed	100	100	100
Ragweed	100	100	60
Soybean	100	100	70
Sunflower	100	100	0
Surinam Grass	100	100	100
Velvetleaf	100	100	100

Table C	Compounds													
250 g ai/ha	1	2	3	6	7	9	10	11	13	14	16	27	28	29
Preemergence														
Bermudagrass	90	95	90	90	85	85	100	50	90	85	95	100	100	100
Cocklebur	-	65	10	100	0	100	-	30	0	70	40	20	0	40
Corn	65	35	35	80	40	55	60	80	60	75	70	20	0	0
Crabgrass, Large	95	100	95	95	100	95	100	85	100	100	100	100	100	100
Cupgrass, Woolly	-	60	65	75	80	25	85	55	55	95	65	40	20	60
Foxtail, Giant	75	100	100	85	80	70	80	80	95	95	90	100	50	100
Goosegrass	90	95	90	100	90	85	-	80	100	100	90	100	90	90
Johnsongrass	80	100	90	90	80	75	100	90	75	100	100	100	90	90
Kochia	100	100	100	100	100	100	100	100	95	100	100	100	90	100
Lambsquarters	100	100	90	100	100	100	100	100	100	100	95	100	100	100
Morningglory	15	45	25	30	0	15	60	0	100	70	0	100	20	-
Nightshade	100	100	95	100	95	85	100	85	100	95	100	100	100	100
Nutsedge, Yellow	60	90	65	80	40	55	50	50	65	70	80	20	20	0
Pigweed	100	95	95	100	100	100	100	100	100	100	100	100	100	100
Ragweed	100	100	100	100	100	100	100	100	100	100	100	0	60	100
Soybean	25	100	40	100	10	40	40	0	15	85	95	30	30	30
Sunflower	25	0	0	100	0	0	0	0	65	100	75	20	0	60
Surinam Grass	100	100	100	100	80	65	90	100	95	95	90	60	50	60
Velvetleaf	85	100	85	100	50	100	-	50	100	100	100	100	100	80

Table C	Compounds													
250 g ai/ha	30	31	34	41	44	46	47	48	50	55	56	57	58	60
Preemergence														
Bermudagrass	90	100	90	100	20	100	100	90	0	100	95	95	100	100
Cocklebur	20	40	0	10	0	90	0	0	80	0	–	0	10	5
Corn	60	–	0	0	0	10	0	0	0	0	0	0	0	0
Crabgrass, Large	100	100	100	100	20	100	100	70	20	95	100	100	95	95
Cupgrass, Woolly	30	30	70	30	10	30	60	5	30	55	35	25	60	70
Foxtail, Giant	70	70	90	30	10	100	80	10	0	75	100	100	100	80
Goosegrass	50	40	100	40	50	100	100	90	100	75	90	90	95	95
Johnsongrass	60	70	100	20	50	90	100	50	0	95	85	80	90	60
Kochia	90	100	–	30	10	100	10	80	100	100	95	100	95	90
Lambsquarters	100	100	100	100	100	100	100	95	100	100	100	100	100	100
Morningglory	70	–	0	20	0	90	90	0	0	20	55	25	50	10
Nightshade	100	100	90	90	100	100	100	95	80	90	95	100	100	90
Nutsedge, Yellow	20	0	0	0	0	0	0	10	40	0	0	0	50	5
Pigweed	100	100	100	100	90	100	100	100	95	95	100	100	100	100
Ragweed	0	60	0	10	70	90	100	70	80	0	95	100	100	95
Soybean	10	10	0	10	10	10	10	0	0	0	10	0	25	0
Sunflower	30	20	0	0	0	10	10	0	0	0	0	0	0	0
Surinam Grass	20	30	60	20	10	60	60	30	80	65	60	35	80	50
Velvetleaf	80	100	90	100	70	100	100	10	5	15	50	100	100	85

Table C	Compounds													
250 g ai/ha	61	62	63	64	65	80	88	95	96	102	108	114	115	130
Preemergence														
Bermudagrass	80	95	90	85	95	10	95	100	85	100	100	100	100	100
Cocklebur	–	0	0	0	0	10	0	10	20	20	30	30	50	70
Corn	0	0	5	0	10	20	5	20	30	10	50	10	20	5
Crabgrass, Large	100	90	90	70	80	10	95	100	100	100	100	100	100	95
Cupgrass, Woolly	0	20	0	0	10	10	80	30	20	20	50	30	80	40
Foxtail, Giant	40	85	10	10	20	50	85	100	100	80	100	40	100	65
Goosegrass	70	85	60	50	60	10	95	85	95	100	100	100	100	30
Johnsongrass	50	70	75	40	65	10	50	60	85	90	100	70	100	30
Kochia	100	100	90	60	85	10	90	100	100	40	100	100	100	20
Lambsquarters	100	100	100	85	100	60	100	–	–	100	100	100	100	80
Morningglory	5	10	40	0	0	50	0	70	80	80	50	–	80	–
Nightshade	40	95	95	95	100	10	95	95	95	100	100	90	100	–
Nutsedge, Yellow	10	40	0	0	0	0	0	0	0	30	80	0	0	0

Pigweed	95	95	100	100	100	100	100	100	100	100	100	100	100	100
Ragweed	80	85	10	0	0	10	5	100	100	90	20	30	100	60
Soybean	0	30	10	10	20	0	0	10	45	0	0	–	0	5
Sunflower	0	0	0	0	0	10	0	0	20	20	20	30	10	0
Surinam Grass	5	50	45	20	0	10	50	60	40	40	90	40	70	20
Velvetleaf	80	70	30	50	5	100	10	80	100	20	100	30	100	100

Table C	Compounds													
250 g ai/ha	131	134	137	139	140	144	145	146	147	149	152	153	156	162
Preemergence														
Bermudagrass	95	95	100	95	60	80	80	70	90	90	100	95	95	20
Cocklebur	25	0	0	0	0	0	0	0	–	0	65	0	100	65
Corn	0	0	5	15	0	40	5	10	0	10	50	0	40	75
Crabgrass, Large	90	95	100	100	75	85	80	–	90	100	100	0	90	80
Cupgrass, Woolly	15	20	5	55	0	5	0	0	10	20	100	0	80	0
Foxtail, Giant	45	0	60	95	65	100	50	60	30	60	100	0	85	60
Goosegrass	80	85	100	90	70	75	75	30	60	90	100	85	90	75
Johnsongrass	45	50	35	50	60	80	80	40	60	80	100	45	100	80
Kochia	100	100	100	100	95	100	60	85	60	60	100	100	100	100
Lambsquarters	100	100	100	100	95	100	90	90	100	95	100	100	100	100
Morningglory	0	0	0	60	0	–	0	40	0	5	100	15	100	100
Nightshade	100	95	90	100	65	100	80	100	90	80	100	100	100	100
Nutsedge, Yellow	0	0	0	5	0	10	0	0	0	0	40	0	85	55
Pigweed	100	100	100	100	100	100	90	95	90	100	100	100	100	100
Ragweed	90	90	70	95	70	50	0	50	0	5	100	15	100	100
Soybean	15	0	0	30	0	60	30	0	0	0	50	0	85	90
Sunflower	0	0	0	20	0	0	0	0	0	0	60	0	80	70
Surinam Grass	15	50	30	30	65	60	65	40	10	40	100	75	85	80
Velvetleaf	20	100	70	100	0	100	100	100	70	0	100	75	100	100

Table C	Compounds													
250 g ai/ha	182	188	193	195	198	199	202	205	207	210	212	213	215	221
Preemergence														
Bermudagrass	90	100	85	30	100	100	95	100	100	100	80	80	85	85
Cocklebur	0	0	–	0	0	0	10	0	0	0	5	100	0	0
Corn	0	0	95	0	0	0	0	0	5	20	30	30	20	0
Crabgrass, Large	75	95	85	5	95	90	95	100	100	95	85	100	85	100
Cupgrass, Woolly	0	70	60	10	10	40	20	10	5	5	20	0	40	0
Foxtail, Giant	60	70	80	0	60	80	80	80	10	10	20	95	70	40

Goosegrass	50	85	80	100	95	90	90	80	80	95	95	80	80	0
Johnsongrass	50	35	90	0	60	60	70	60	40	50	50	60	50	10
Kochia	65	0	100	10	100	90	85	90	90	90	90	100	100	65
Lambsquarters	95	100	100	10	100	100	100	90	95	100	100	100	100	90
Morningglory	65	60	100	0	85	70	80	10	0	5	5	0	0	0
Nightshade	85	100	85	0	100	100	100	100	100	100	100	100	100	70
Nutsedge, Yellow	0	0	10	0	0	0	0	0	20	5	0	0	0	0
Pigweed	95	95	100	90	100	100	100	95	100	100	100	100	100	100
Ragweed	60	75	100	80	95	80	95	50	60	90	30	0	100	-
Soybean	0	0	50	0	0	5	0	20	0	0	0	0	0	0
Sunflower	0	0	0	0	10	0	10	0	0	0	0	0	0	0
Surinam Grass	25	75	95	85	30	30	40	50	0	10	5	20	30	10
Velvetleaf	20	45	70	55	80	85	100	60	40	60	100	0	40	60

Table C							Compounds							
250 g ai/ha	222	223	242	244	268	269	287	293	294	298	299	300	301	304
Preemergence														
Bermudagrass	100	100	100	100	100	100	95	100	90	80	100	100	90	100
Cocklebur	70	0	35	0	70	5	10	20	80	0	80	5	0	0
Corn	60	5	20	10	60	40	50	80	60	15	60	35	40	15
Crabgrass, Large	100	100	100	100	100	100	95	100	100	100	100	100	100	100
Cupgrass, Woolly	100	-	95	85	95	60	10	95	80	30	90	60	70	60
Foxtail, Giant	95	100	100	95	95	100	85	100	90	70	100	100	95	60
Goosegrass	100	80	100	100	100	95	100	95	85	100	100	100	100	90
Johnsongrass	100	-	100	95	100	100	95	100	100	60	100	95	85	70
Kochia	100	100	-	-	100	100	100	100	100	100	100	100	100	85
Lambsquarters	100	100	-	-	100	100	100	100	100	100	100	100	100	100
Morningglory	30	5	0	20	5	10	-	100	50	20	100	40	10	10
Nightshade	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Nutsedge, Yellow	20	0	15	0	60	40	60	0	80	20	60	60	10	0
Pigweed	100	100	100	100	100	100	100	95	100	100	100	100	100	100
Ragweed	100	100	100	100	100	90	100	100	100	0	100	10	65	70
Soybean	100	80	65	10	90	50	85	90	100	5	90	70	20	20
Sunflower	30	0	50	15	60	5	100	65	100	0	100	5	0	0
Surinam Grass	100	70	95	100	95	85	65	100	100	40	100	100	80	40
Velvetleaf	100	100	100	100	100	75	100	100	100	100	100	5	100	-

Table C	Compounds													
250 g ai/ha	305	306	307	309	310	314	318	332	333	334	336	340	341	342
Preemergence														
Bermudagrass	100	90	100	95	100	60	90	100	100	100	100	85	100	90
Cocklebur	65	0	35	60	5	0	0	0	0	70	30	0	50	60
Corn	45	20	30	40	5	0	10	0	0	50	85	45	85	70
Crabgrass, Large	100	100	100	100	100	40	60	100	100	100	100	100	90	70
Cupgrass, Woolly	60	30	70	90	70	0	0	5	0	85	60	45	100	50
Foxtail, Giant	100	90	100	90	85	20	50	60	50	100	90	60	55	55
Goosegrass	95	100	100	100	95	65	80	100	85	100	100	85	85	65
Johnsongrass	95	80	90	95	20	70	60	50	5	100	100	50	100	100
Kochia	100	100	100	100	100	30	85	100	100	100	100	90	100	100
Lambsquarters	100	100	100	100	100	30	100	100	100	100	100	100	100	100
Morningglory	5	10	10	5	5	30	0	0	0	40	100	10	5	70
Nightshade	100	100	100	100	100	90	95	95	98	100	100	100	100	80
Nutsedge, Yellow	25	10	50	45	0	0	0	0	0	55	20	0	30	40
Pigweed	100	100	100	100	100	90	100	100	100	100	100	100	100	100
Ragweed	85	-	100	70	50	40	70	5	50	100	80	20	100	100
Soybean	90	15	80	80	30	40	10	0	0	80	50	0	70	100
Sunflower	0	0	60	5	0	20	0	0	0	55	30	0	50	75
Surinam Grass	60	40	90	90	30	0	50	10	5	95	100	65	100	100
Velvetleaf	100	-	100	75	10	80	100	45	50	85	100	95	100	100

Table C	Compounds	
250 g ai/ha	343	352
Preemergence		
Bermudagrass	90	100
Cocklebur	80	0
Corn	70	30
Crabgrass, Large	80	100
Cupgrass, Woolly	70	60
Foxtail, Giant	70	100
Goosegrass	80	100
Johnsongrass	100	90
Kochia	100	100
Lambsquarters	100	100

Table C	Compounds	
250 g ai/ha	343	352
Preemergence		
Morningglory	100	40
Nightshade	90	50
Nutsedge, Yellow	60	10
Pigweed	100	100
Ragweed	90	50
Soybean	100	50
Sunflower	80	0
Surinam Grass	100	100
Velvetleaf	100	70

Table C	Compounds													
125 g ai/ha	1	2	3	4	5	6	7	9	10	11	13	14	16	27
Preemergence														
Bermudagrass	85	90	90	95	10	90	70	65	50	30	80	55	75	100
Cocklebur	-	5	5	60	0	100	0	0	0	10	0	65	0	10
Corn	45	30	0	0	0	60	30	25	40	70	50	70	55	0
Crabgrass, Large	80	95	80	80	70	95	85	80	90	80	100	100	95	100
Cupgrass, Woolly	35	60	30	20	0	55	30	15	0	55	20	60	45	20
Foxtail, Giant	65	100	90	70	5	80	70	60	70	60	20	95	70	100
Goosegrass	85	95	90	85	50	100	70	80	80	70	90	95	80	90
Johnsongrass	75	90	70	65	20	90	50	55	90	65	60	85	80	90
Kochia	100	100	80	-	10	100	80	100	100	100	90	100	100	100
Lambsquarters	100	100	90	100	60	100	85	100	100	100	100	100	95	100
Morningglory	0	20	20	20	40	0	0	0	10	0	90	65	0	100
Nightshade	100	100	95	95	100	100	60	75	100	80	90	90	100	100
Nutsedge, Yellow	25	65	30	25	0	70	20	25	30	0	25	55	75	20
Pigweed	100	95	95	95	95	100	100	95	100	100	100	100	100	100
Ragweed	100	100	95	80	95	100	50	100	100	100	100	100	100	0
Soybean	0	40	10	35	0	90	0	20	0	0	0	35	75	10
Sunflower	0	0	0	0	0	50	0	0	0	0	0	75	20	20
Surinam Grass	75	95	70	50	55	100	50	45	40	95	85	95	75	30
Velvetleaf	85	100	85	90	30	100	0	50	-	10	100	100	100	100

Table C	Compounds													
125 g ai/ha	28	29	30	31	33	34	35	41	44	46	47	48	50	55
Preemergence														
Bermudagrass	90	100	90	90	90	50	100	50	-	100	100	90	0	100
Cocklebur	0	-	0	20	30	0	20	0	-	40	0	0	10	0
Corn	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	100	100	90	100	100	100	50	100	20	100	100	30	0	90
Cupgrass, Woolly	20	20	10	0	50	20	20	0	10	10	10	0	10	25
Foxtail, Giant	20	80	40	30	60	70	30	20	10	60	70	0	0	50
Goosegrass	70	60	30	30	90	80	70	30	30	90	100	70	80	50
Johnsongrass	60	-	-	30	80	80	70	-	30	80	100	20	-	75
Kochia	0	80	70	80	100	90	10	20	10	90	10	60	85	80
Lambsquarters	100	90	100	100	100	100	100	90	100	100	100	95	85	95
Morningglory	20	100	-	40	0	0	-	0	0	0	0	-	0	0
Nightshade	100	100	90	90	100	90	90	10	90	100	100	80	5	60
Nutsedge, Yellow	0	-	0	0	0	0	0	0	0	0	0	0	10	0

Pigweed	100	100	100	100	100	100	100	90	70	100	100	100	90	95
Ragweed	20	0	0	0	10	0	80	0	30	40	80	5	40	0
Soybean	0	30	0	0	0	0	0	0	10	0	0	0	0	0
Sunflower	0	60	10	20	0	0	10	0	0	10	0	0	0	0
Surinam Grass	20	30	20	20	30	20	20	20	10	30	10	5	10	25
Velvetleaf	70	80	30	70	70	60	100	40	70	100	40	0	5	0

Table C	Compounds													
125 g ai/ha	56	57	58	60	61	62	63	64	65	80	88	95	96	102
Preemergence														
Bermudagrass	90	95	100	100	70	90	90	30	85	10	95	100	80	100
Cocklebur	0	0	5	0	0	0	0	0	0	10	0	5	5	20
Corn	0	0	0	0	0	0	0	0	0	10	5	10	15	0
Crabgrass, Large	100	100	95	90	75	90	85	40	50	10	95	100	100	100
Cupgrass, Woolly	0	0	40	10	0	0	0	0	0	10	30	10	10	10
Foxtail, Giant	85	95	100	15	20	65	5	0	0	40	50	100	100	50
Goosegrass	85	75	95	85	40	70	45	10	30	10	90	50	80	100
Johnsongrass	70	65	80	50	30	40	60	20	40	10	20	40	60	80
Kochia	90	100	95	90	100	100	80	30	70	10	85	100	95	30
Lambsquarters	100	100	100	100	100	100	95	0	95	10	95	-	-	70
Morningglory	0	0	20	5	0	0	40	0	0	-	0	10	50	70
Nightshade	95	95	100	90	20	90	90	50	90	10	90	95	95	100
Nutsedge, Yellow	0	0	20	0	0	10	0	0	0	0	0	0	0	0
Pigweed	100	100	100	100	95	95	100	70	100	100	100	100	100	100
Ragweed	95	100	85	80	0	20	0	0	0	0	0	80	90	20
Soybean	0	0	5	0	0	0	0	0	0	0	0	0	5	0
Sunflower	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Surinam Grass	15	15	55	0	0	10	5	5	0	10	20	10	10	-
Velvetleaf	35	0	100	70	45	-	10	30	0	100	0	60	50	20

Table C	Compounds													
125 g ai/ha	108	114	115	118	128	130	131	134	137	139	140	144	145	146
Preemergence														
Bermudagrass	100	90	100	100	100	90	90	95	100	90	0	80	60	60
Cocklebur	30	20	40	20	10	-	20	0	0	0	0	0	0	0
Corn	40	10	10	10	20	5	0	0	5	0	0	30	0	0
Crabgrass, Large	100	100	100	100	100	90	90	95	70	100	65	70	50	-
Cupgrass, Woolly	50	10	30	0	20	10	0	0	0	10	0	5	0	0
Foxtail, Giant	100	30	90	10	10	45	20	0	50	80	25	70	0	10

Goosegrass	100	80	80	80	90	20	65	65	85	85	0	60	70	0
Johnsongrass	100	30	100	100	90	-	40	40	5	30	45	0	65	30
Kochia	100	90	100	20	0	0	85	100	90	100	75	80	60	50
Lambsquarters	100	100	100	60	30	30	100	100	100	100	85	95	60	90
Morningglory	-	60	30	30	30	0	0	0	0	10	0	30	0	5
Nightshade	100	90	100	100	90	-	95	95	85	100	0	100	70	60
Nutsedge, Yellow	70	0	0	0	70	0	0	0	0	0	0	0	0	0
Pigweed	100	100	100	90	60	90	100	95	100	100	100	90	90	95
Ragweed	20	10	80	10	20	10	50	25	0	50	0	30	0	0
Soybean	0	-	0	10	20	0	0	0	0	10	-	40	10	0
Sunflower	20	30	-	20	50	0	0	0	0	10	0	0	0	0
Surinam Grass	40	10	40	20	60	5	0	15	10	20	0	40	50	0
Velvetleaf	90	30	100	40	100	10	15	90	10	30	0	100	20	40

Table C							Compounds							
125 g ai/ha	147	149	152	153	156	162	183	188	193	195	198	199	202	305
Preemergence														
Bermudagrass	70	90	90	95	93	0	75	100	80	0	85	85	85	100
Cocklebur	-	0	65	0	98	-	0	0	-	0	0	0	0	0
Corn	0	0	45	0	38	70	0	0	60	0	0	0	0	0
Crabgrass, Large	50	90	100	0	85	40	25	95	85	0	85	90	95	80
Cupgrass, Woolly	10	5	50	0	70	0	0	60	40	0	5	0	10	10
Foxtail, Giant	0	50	100	0	83	60	0	55	50	0	10	10	40	10
Goosegrass	20	70	100	75	90	60	35	70	80	100	80	70	85	70
Johnsongrass	40	60	100	15	85	80	35	20	85	0	30	30	40	10
Kochia	40	10	100	95	95	75	60	0	85	0	80	85	85	90
Lambsquarters	90	95	100	100	100	95	95	100	100	0	100	95	90	90
Morningglory	0	5	80	0	60	100	15	-	30	0	70	50	55	0
Nightshade	70	80	90	100	93	100	80	95	50	0	95	95	95	100
Nutsedge, Yellow	0	0	30	0	60	20	0	0	0	0	0	0	0	0
Pigweed	90	100	100	100	98	100	95	95	100	60	100	100	100	95
Ragweed	0	0	85	0	100	95	20	65	100	40	80	60	80	20
Soybean	0	0	10	0	50	75	0	0	30	0	0	0	0	20
Sunflower	0	0	10	0	45	15	0	0	0	0	0	0	0	0
Surinam Grass	10	5	60	0	88	75	20	30	80	0	10	0	20	20
Velvetleaf	20	0	100	20	63	75	0	0	0	50	80	70	10	40

Table C	Compounds													
125 g ai/ha	207	210	212	213	215	221	222	223	242	244	268	269	287	293
Preemergence														
Bermudagrass	80	80	75	60	70	10	100	80	100	100	100	100	95	95
Cocklebur	0	0	0	-	0	0	20	0	0	0	60	0	0	-
Corn	0	10	0	0	20	0	20	0	0	10	45	20	-	10
Crabgrass, Large	90	80	80	50	70	100	100	100	100	100	95	100	95	95
Cupgrass, Woolly	0	0	0	0	10	0	100	10	80	65	70	40	0	70
Foxtail, Giant	0	10	20	50	50	0	85	70	100	95	95	90	70	70
Goosegrass	60	80	60	60	40	0	100	80	100	95	90	85	100	85
Johnsongrass	10	20	0	55	20	0	100	80	95	95	90	60	85	95
Kochia	90	90	85	85	100	0	100	90	-	-	100	100	100	100
Lambsquarters	95	100	100	95	100	20	100	100	-	-	100	100	100	100
Morningglory	0	0	0	0	0	0	20	0	0	15	0	5	-	-
Nightshade	75	100	100	100	100	50	100	100	100	100	100	100	100	100
Nutsedge, Yellow	0	0	0	0	0	0	0	0	0	0	50	10	15	0
Pigweed	100	100	100	100	100	100	100	100	100	100	100	100	100	85
Ragweed	50	0	0	0	0	0	100	80	100	100	90	10	100	100
Soybean	0	0	0	0	0	0	70	30	65	0	75	10	60	85
Sunflower	0	0	0	0	0	0	0	0	0	0	5	0	100	-
Surinam Grass	0	5	0	0	0	0	100	65	95	100	70	70	50	80
Velvetleaf	10	0	100	0	0	0	50	0	100	100	100	70	95	100

Table C	Compounds													
125 g ai/ha	294	298	299	300	301	304	305	306	307	309	310	314	318	332
Preemergence														
Bermudagrass	80	55	100	100	90	70	85	85	100	90	85	60	70	100
Cocklebur	40	0	40	5	0	0	15	0	30	10	0	0	0	0
Corn	60	10	25	30	10	0	40	10	20	20	0	0	0	0
Crabgrass, Large	95	95	100	100	100	100	100	100	100	80	70	0	50	100
Cupgrass, Woolly	75	10	70	50	50	10	60	15	40	70	10	0	0	0
Foxtail, Giant	80	70	100	65	60	50	85	40	85	80	40	0	10	20
Goosegrass	80	95	100	100	90	85	85	70	95	85	80	40	10	85
Johnsongrass	100	40	100	85	-	60	90	60	80	80	10	20	0	10
Kochia	100	95	100	100	100	80	100	90	100	100	100	0	60	100
Lambsquarters	100	100	100	100	100	100	100	100	100	100	100	10	95	100
Morningglory	30	5	75	40	5	10	0	5	10	5	5	10	0	0
Nightshade	100	100	100	100	95	100	90	95	100	80	35	85	90	90
Nutsedge, Yellow	55	0	50	20	5	0	20	0	20	30	0	0	0	0

Pigweed	100	100	100	100	100	100	100	100	100	100	100	60	95	100
Ragweed	100	0	100	5	60	0	85	70	100	-	0	0	40	5
Soybean	95	0	80	30	20	0	60	10	60	40	0	10	0	0
Sunflower	50	0	85	0	0	0	0	0	10	0	0	0	0	0
Surinam Grass	95	5	90	65	30	5	55	10	85	70	10	0	20	5
Velvetleaf	100	60	80	5	70	0	100	5	100	70	10	0	70	45

Table C	Compounds							
125 g ai/ha	333	334	336	340	341	342	343	352
Preemergence								
Bermudagrass	85	100	100	70	80	60	70	100
Cocklebur	0	60	5	0	10	30	80	0
Corn	0	20	35	45	60	50	70	15
Crabgrass, Large	70	100	100	70	80	60	80	85
Cupgrass, Woolly	0	60	10	20	80	40	65	50
Foxtail, Giant	10	80	5	10	50	40	50	60
Goosegrass	30	100	100	60	85	65	75	85
Johnsongrass	0	100	95	50	85	100	80	90
Kochia	100	100	70	20	100	100	100	85
Lambsquarters	100	100	100	80	100	90	100	100
Morningglory	0	20	70	5	5	5	60	5
Nightshade	20	100	95	90	55	80	60	0
Nutsedge, Yellow	0	40	5	0	0	0	10	0
Pigweed	100	100	100	85	95	90	90	85
Ragweed	0	100	55	0	100	95	90	40
Soybean	0	80	25	0	20	60	80	15
Sunflower	0	35	10	0	0	20	75	0
Surinam Grass	0	70	85	60	95	90	85	50
Velvetleaf	0	50	30	60	60	60	80	5

Table C	Compounds													
62 g ai/ha	1	2	3	4	5	6	7	9	10	11	13	14	16	27
Preemergence														
Bermudagrass	80	85	60	85	0	80	60	65	50	0	0	45	70	90
Cocklebur	-	5	0	50	0	60	0	0	-	-	0	0	0	0
Corn	25	0	0	0	0	60	0	15	35	25	0	60	20	0
Crabgrass, Large	65	95	70	60	30	75	60	40	10	80	100	95	80	100
Cupgrass, Woolly	-	40	0	0	0	50	0	0	0	10	0	20	15	10
Foxtail, Giant	55	80	10	20	0	60	0	45	40	5	0	65	25	50

Goosegrass	80	90	60	60	0	85	0	65	60	50	85	95	75	30
Johnsongrass	70	70	50	30	0	70	10	45	60	50	0	70	50	60
Kochia	95	100	50	–	0	100	30	95	80	85	50	100	95	90
Lambsquarters	100	100	90	90	40	100	20	95	95	95	95	100	95	100
Morningglory	0	5	–	–	0	0	0	0	0	0	75	45	0	100
Nightshade	100	100	90	95	90	100	50	0	80	50	55	75	95	100
Nutsedge, Yellow	15	30	0	10	0	50	0	0	10	0	0	20	40	0
Pigweed	100	95	90	95	80	100	30	95	100	80	100	100	100	100
Ragweed	100	80	85	60	0	100	50	0	100	0	95	100	85	0
Soybean	0	30	10	20	0	70	0	0	0	0	0	15	0	0
Sunflower	0	0	0	0	0	0	0	0	0	0	0	60	0	10
Surinam Grass	50	90	60	50	0	85	0	0	–	–	45	90	65	20
Velvetleaf	70	60	80	80	30	40	0	25	0	10	85	90	100	40

Table C							Compounds							
62 g ai/ha	28	29	30	31	33	34	35	41	44	46	47	48	50	55
Preemergence														
Bermudagrass	90	90	10	20	80	20	90	30	0	90	90	80	0	60
Cocklebur	0	30	0	0	0	0	0	0	0	0	0	0	0	0
Corn	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	100	100	90	90	100	80	10	90	0	100	100	0	0	15
Cupgrass, Woolly	20	0	10	0	20	10	10	0	0	10	10	0	0	0
Foxtail, Giant	0	20	20	20	20	10	20	20	10	10	40	0	0	0
Goosegrass	30	30	20	30	60	20	30	30	10	60	80	30	40	0
Johnsongrass	20	90	0	0	20	50	50	0	30	50	20	10	0	0
Kochia	0	20	0	0	100	90	10	20	0	0	10	10	30	25
Lambsquarters	90	90	90	90	100	90	90	50	90	100	100	85	85	80
Morningglory	20	100	0	–	0	0	100	0	0	0	0	0	0	0
Nightshade	100	100	80	90	60	10	–	0	80	90	100	50	0	15
Nutsedge, Yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pigweed	100	100	90	100	50	100	90	0	10	20	100	100	90	95
Ragweed	0	–	0	0	0	0	10	0	0	10	80	0	10	0
Soybean	0	30	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower	0	50	10	0	0	0	10	0	0	0	0	0	0	0
Surinam Grass	20	10	0	10	20	10	10	20	10	10	0	0	0	0
Velvetleaf	20	80	0	20	–	0	100	40	70	90	40	0	0	0

Table C	Compounds													
62 g ai/ha	56	57	58	60	61	62	63	64	65	80	88	95	96	102
Preemergence														
Bermudagrass	85	55	90	80	10	10	50	0	40	10	90	70	40	100
Cocklebur	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Corn	0	0	0	0	0	0	0	0	0	0	0	0	15	0
Crabgrass, Large	95	95	90	90	50	40	10	0	50	0	90	80	85	100
Cupgrass, Woolly	0	0	0	0	0	0	0	0	0	0	20	5	5	0
Foxtail, Giant	45	20	70	0	0	15	0	0	0	10	0	60	70	10
Goosegrass	60	45	90	55	0	10	10	0	0	10	60	0	30	90
Johnsongrass	55	20	70	10	10	40	30	0	10	10	0	0	40	50
Kochia	75	100	95	90	10	100	30	0	10	10	0	100	90	0
Lambsquarters	85	100	100	100	100	100	30	0	20	0	95	-	-	0
Morningglory	0	0	10	0	0	-	0	0	0	20	0	5	0	30
Nightshade	90	85	95	30	0	80	70	0	50	10	40	95	90	90
Nutsedge, Yellow	0	0	10	0	0	0	0	0	0	0	0	0	0	0
Pigweed	100	100	100	100	0	95	100	30	70	40	100	100	100	90
Ragweed	60	65	60	10	0	10	0	0	0	0	0	50	50	10
Soybean	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunflower	0	0	0	0	0	0	0	0	0	-	0	0	0	0
Surinam Grass	10	0	10	0	0	5	0	0	0	0	10	0	0	0
Velvetleaf	20	0	80	5	0	40	10	0	0	20	0	0	50	0

Table C	Compounds													
62 g ai/ha	108	114	115	118	128	130	131	134	137	139	140	144	145	146
Preemergence														
Bermudagrass	100	50	100	90	100	60	15	80	50	60	0	70	20	10
Cocklebur	20	20	20	20	10	0	0	0	0	0	0	0	0	0
Corn	30	10	10	0	20	0	0	0	0	0	0	0	0	0
Crabgrass, Large	100	100	100	70	100	-	45	65	40	40	0	50	-	20
Cupgrass, Woolly	30	-	20	0	10	5	0	0	0	0	0	0	0	0
Foxtail, Giant	100	20	40	0	10	40	20	0	10	40	0	40	0	0
Goosegrass	90	40	70	20	80	10	15	20	40	60	0	30	50	0
Johnsongrass	60	20	70	40	90	-	15	0	0	20	0	0	50	-
Kochia	100	90	100	20	0	0	85	85	80	100	70	75	20	50
Lambsquarters	100	80	100	50	-	10	95	100	40	100	75	95	20	85
Morningglory	40	-	-	20	30	0	0	0	0	0	0	0	0	0
Nightshade	100	70	100	100	90	30	55	90	60	95	0	90	60	50
Nutsedge, Yellow	50	0	0	0	-	0	0	0	0	0	0	0	0	0

Pigweed	100	100	100	70	–	80	95	95	100	100	100	90	85	80
Ragweed	20	10	70	0	10	0	40	0	0	50	0	0	0	0
Soybean	–	70	0	0	20	0	0	0	0	–	0	0	–	0
Sunflower	20	30	0	0	–	0	0	0	0	0	0	0	0	0
Surinam Grass	30	10	20	–	30	5	0	0	0	0	0	20	0	0
Velvetleaf	60	30	20	0	30	0	0	20	0	–	0	20	0	0

Table C	Compounds													
62 g ai/ha	147	149	152	153	156	162	182	188	193	195	198	199	202	205
Preemergence														
Bermudagrass	40	30	85	70	88	0	20	75	60	0	60	55	20	90
Cocklebur	0	0	–	0	63	–	0	0	0	0	0	0	0	0
Corn	0	0	40	0	15	20	0	0	10	0	0	0	0	0
Crabgrass, Large	0	20	100	0	60	35	0	95	40	0	80	10	80	60
Cupgrass, Woolly	0	0	40	0	33	0	0	0	10	0	0	0	0	0
Foxtail, Giant	0	0	70	0	75	55	0	0	40	0	0	0	0	0
Goosegrass	0	10	80	55	83	60	0	15	60	100	20	5	20	50
Johnsongrass	0	10	80	0	80	65	0	0	60	0	0	0	0	0
Kochia	–	0	100	65	95	65	0	0	85	0	50	80	60	90
Lambsquarters	70	75	100	95	100	80	25	95	50	0	85	80	40	85
Morningglory	0	0	20	0	8	45	0	0	20	0	10	–	0	0
Nightshade	40	80	80	90	75	80	70	80	0	0	90	85	20	80
Nutsedge, Yellow	0	0	10	0	35	0	0	0	0	0	0	0	0	0
Pigweed	20	20	85	95	95	100	95	95	100	55	100	100	95	90
Ragweed	0	0	85	0	90	95	20	0	0	20	50	55	0	0
Soybean	0	0	0	0	33	15	0	0	30	0	0	0	0	–
Sunflower	0	0	0	0	25	0	0	0	0	0	0	0	0	0
Surinam Grass	0	0	40	0	75	0	0	20	50	0	0	0	10	0
Velvetleaf	5	0	0	0	43	70	0	0	0	0	5	10	5	10

Table C	Compounds													
62 g ai/ha	207	210	212	213	215	221	222	223	242	244	268	269	287	293
Preemergence														
Bermudagrass	50	80	60	50	40	0	85	80	95	95	100	100	85	90
Cocklebur	0	0	0	–	0	0	0	0	0	0	10	0	0	0
Corn	0	0	0	0	0	0	0	0	0	0	10	–	–	–
Crabgrass, Large	80	80	60	0	0	0	100	100	100	100	90	95	65	95
Cupgrass, Woolly	0	0	0	0	0	0	20	0	75	65	50	10	0	45
Foxtail, Giant	0	0	0	30	0	0	20	40	85	80	80	50	0	10

Goosegrass	10	50	10	0	0	0	80	60	100	70	85	70	70	65
Johnsongrass	0	5	0	0	0	0	85	80	65	60	70	40	55	65
Kochia	90	0	85	-	100	0	90	85	-	-	100	70	85	100
Lambsquarters	90	100	100	80	100	0	100	95	-	-	100	95	100	100
Morningglory	0	0	0	0	0	0	0	0	0	0	0	0	-	-
Nightshade	60	80	70	100	100	30	85	100	100	100	100	90	95	65
Nutsedge, Yellow	0	0	0	0	0	0	0	0	0	0	30	5	0	0
Pigweed	100	100	100	80	80	90	100	100	100	100	100	100	100	20
Ragweed	40	0	0	0	0	0	80	-	95	95	70	5	100	85
Soybean	0	0	0	0	0	0	40	0	0	0	60	0	0	0
Sunflower	0	0	0	0	0	0	0	0	0	0	0	0	90	10
Surinam Grass	0	0	0	0	0	0	80	50	85	100	70	5	-	-
Velvetleaf	0	0	20	0	0	0	50	0	100	15	60	5	40	80

Table C							Compounds							
62 g ai/ha	294	298	299	300	301	304	305	306	307	309	310	314	318	332
Preemergence														
Bermudagrass	70	50	100	95	80	5	80	40	90	90	50	10	10	80
Cocklebur	30	0	0	5	0	0	10	0	0	0	0	0	0	0
Corn	55	0	-	30	10	0	0	5	0	5	-	0	0	0
Crabgrass, Large	70	85	100	100	90	35	70	100	80	-	30	0	-	75
Cupgrass, Woolly	55	5	50	20	10	5	20	5	5	40	5	0	0	0
Foxtail, Giant	-	20	100	30	35	5	35	5	70	70	5	0	0	0
Goosegrass	80	85	100	85	50	45	80	50	90	85	70	0	0	80
Johnsongrass	80	20	85	60	30	0	65	40	60	75	0	0	0	0
Kochia	100	80	100	60	100	-	100	0	100	100	95	0	10	100
Lambsquarters	100	100	100	100	100	0	100	100	100	100	95	0	80	100
Morningglory	30	-	5	5	5	0	0	5	0	0	0	0	0	0
Nightshade	100	100	100	100	90	80	60	90	100	70	30	60	80	20
Nutsedge, Yellow	50	0	40	0	0	0	10	0	5	5	0	0	0	0
Pigweed	100	100	100	100	100	100	100	100	100	80	100	30	80	100
Ragweed	100	0	100	5	10	0	10	0	80	50	0	0	0	0
Soybean	70	0	55	0	15	0	0	5	40	30	0	0	0	0
Sunflower	30	0	10	0	0	0	0	0	0	0	0	0	0	0
Surinam Grass	85	5	75	30	0	0	50	-	70	50	5	0	10	5
Velvetleaf	100	60	5	5	20	0	40	5	70	5	0	0	60	40

Table C	Compounds							
62 g ai/ha	333	334	336	340	341	342	343	352
Preemergence								
Bermudagrass	40	100	95	20	80	45	60	95
Cocklebur	0	30	0	0	0	10	30	0
Corn	0	0	10	5	10	10	40	0
Crabgrass, Large	20	85	100	50	50	60	50	55
Cupgrass, Woolly	0	25	5	0	80	10	40	5
Foxtail, Giant	0	60	0	0	0	0	40	5
Goosegrass	0	100	95	5	70	60	60	80
Johnsongrass	0	90	80	15	15	55	70	50
Kochia	60	100	5	10	80	50	90	80
Lambsquarters	95	100	100	70	100	70	100	85
Morningglory	0	5	5	0	0	0	5	5
Nightshade	-	100	85	60	50	60	60	0
Nutsedge, Yellow	0	10	0	0	0	0	5	0
Pigweed	100	100	100	70	95	80	80	40
Ragweed	0	75	30	0	50	55	70	0
Soybean	0	15	0	0	0	10	40	0
Sunflower	0	5	0	0	0	5	10	0
Surinam Grass	-	55	50	0	60	40	60	10
Velvetleaf	0	5	5	0	30	50	60	0

Table C	Compounds													
31 g ai/ha	4	5	27	29	33	35	41	60	62	80	95	114	118	129
Preemergence														
Bermudagrass	30	0	20	40	50	30	30	30	0	0	10	10	30	90
Cocklebur	0	0	0	30	0	0	0	0	0	-	0	0	0	10
Corn	0	0	0	0	0	0	-	0	0	0	0	10	0	20
Crabgrass, Large	40	0	100	90	90	0	0	80	5	0	10	100	10	10
Cupgrass, Woolly	0	0	0	0	20	10	0	0	0	0	0	0	0	10
Foxtail, Giant	0	0	10	0	10	0	0	0	5	10	0	20	0	0
Goosegrass	10	0	20	20	20	20	10	10	0	10	0	20	20	20
Johnsongrass	5	0	20	20	20	10	0	5	0	0	0	0	30	60
Kochia	10	0	20	0	80	0	0	80	100	10	80	90	10	0
Lambsquarters	90	0	90	60	80	0	0	90	100	0	-	40	50	10
Morningglory	-	0	90	90	0	0	0	0	-	0	0	40	0	30
Nightshade	90	80	90	90	10	70	0	10	80	0	90	20	60	70
Nutsedge, Yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	70

Pigweed	90	40	100	80	30	0	0	100	90	30	100	0	20	50
Ragweed	50	0	0	0	0	0	0	0	0	0	10	10	0	0
Soybean	0	0	0	30	0	0	0	0	0	0	0	60	0	20
Sunflower	0	0	0	30	0	10	0	0	0	0	0	30	0	50
Surinam Grass	0	0	20	0	20	0	10	0	0	0	0	10	20	20
Velvetleaf	5	0	0	10	0	0	0	5	0	30	0	0	0	30

Table C	Compounds				
31 g ai/ha	131	139	156	300	334
Preemergence					
Bermudagrass	0	10	60	80	100
Cocklebur	0	0	40	0	5
Corn	0	0	0	0	0
Crabgrass, Large	0	20	60	100	70
Cupgrass, Woolly	0	0	20	5	20
Foxtail, Giant	0	0	40	10	30
Goosegrass	0	0	70	70	85
Johnsongrass	0	0	70	40	80
Kochia	85	70	90	60	100
Lambsquarters	95	100	100	80	100
Morningglory	0	0	0	5	0
Nightshade	0	70	-	90	100
Nutsedge, Yellow	0	0	10	0	5
Pigweed	95	100	80	100	85
Ragweed	0	0	-	5	75
Soybean	0	0	20	0	10
Sunflower	0	0	0	0	0
Surinam Grass	0	0	40	5	50
Velvetleaf	0	0	20	5	0

Table C	Compounds						
16 g ai/ha	4	5	33	35	118	128	156
Preemergence							
Bermudagrass	0	0	30	0	0	30	0
Cocklebur	0	0	0	0	0	10	-
Corn	0	0	0	0	0	20	0
Crabgrass, Large	0	0	0	0	0	10	30
Cupgrass, Woolly	0	0	20	10	0	0	0
Foxtail, Giant	0	0	0	0	0	0	0

Goosegrass	5	0	10	0	20	10	50
Johnsongrass	0	0	20	10	30	0	5
Kochia	0	0	70	0	10	0	60
Lambsquarters	50	0	0	0	40	0	85
Morningglory	–	–	0	0	0	20	0
Nightshade	–	80	10	20	20	50	30
Nutsedge, Yellow	0	0	0	0	0	10	0
Pigweed	90	0	10	0	20	0	80
Ragweed	0	0	0	0	0	0	0
Soybean	0	0	0	0	0	20	0
Sunflower	0	0	0	10	0	50	0
Surinam Grass	0	0	20	0	20	0	0
Velvetleaf	0	0	0	0	0	20	0

TEST D

Three plastic pots (ca. 16-cm diameter) per rate were partially filled with sterilized Tama silt loam soil comprising a 35:50:15 ratio of sand, silt and clay and 2.6% organic matter. Separate plantings for each of the three pots were as follows. Seeds from the U.S. of ducksalad (*Heteranthera limosa* (Sw.) Willd.), smallflower umbrella sedge (*Cyperus difformis* L.) and purple redstem (*Ammannia coccinea* Rottb.), were planted into one 16-cm pot for each rate. Seeds from the U.S. of rice flatsedge (*Cyperus iria* L.), bearded sprangletop (*Leptochloa fascicularis* (Lam.) Gray), one stand of 9 or 10 water seeded rice seedlings (*Oryza sativa* L. cv. 'Japonica – M202'), and one stand of 6 transplanted rice seedlings (*Oryza sativa* L. cv. 'Japonica – M202') were planted into one 16-cm pot for each rate. Seeds from the U.S. of barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.), late watergrass (*Echinochloa oryzicola* Vasinger), early watergrass (*Echinochloa oryzoides* (Ard.) Fritsch) and junglerice (*Echinochloa colona* (L.) Link) were planted into one 16-cm pot for each rate. Plantings were sequential so that crop and weed species were at the 2.0 to 2.5-leaf stage at time of treatment.

Potted plants were grown in a greenhouse with day/night temperature settings of 29.5/26.7 °C, and supplemental balanced lighting was provided to maintain a 16-hour photoperiod. Test pots were maintained in the greenhouse until test completion.

At time of treatment, test pots were flooded to 3 cm above the soil surface, treated by application of test compounds directly to the paddy water, and then maintained at that water depth for the duration of the test. Effects of treatments on rice and weeds were visually evaluated by comparison to untreated controls after 21 days. Plant response ratings are reported on a 0 to 100 scale; where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table D	Compounds	
Rate 1000 g ai/ha	3	215
Flooded Paddy		
Barnyardgrass	90	40
Ducksalad	100	75
Flatsedge, Rice	100	90
Junglerice	100	25
Redstem	100	100
Rice, Transplanted	60	35
Rice, Water Seeded	80	45
Sedge, Umbrella	100	100
Sprangletop, Bearded	85	20
Watergrass, Early	60	40
Watergrass, Late	80	20

Table D	Compounds	
Rate 750 g ai/ha	3	215
Flooded Paddy		
Barnyardgrass	60	30
Ducksalad	100	20
Flatsedge, Rice	100	80
Junglerice	100	25
Redstem	100	100
Rice, Transplanted	60	20
Rice, Water Seeded	70	45
Sedge, Umbrella	100	95
Sprangletop, Bearded	85	20
Watergrass, Early	45	25
Watergrass, Late	60	20

Table D	Compounds		
Rate 500 g ai/ha	3	155	215
Flooded Paddy			
Barnyardgrass	20	80	0
Ducksalad	95	60	20
Flatsedge, Rice	100	70	60
Junglerice	70	65	20
Redstem	100	95	100
Rice, Transplanted	50	30	20
Rice, Water Seeded	60	40	45
Sedge, Umbrella	100	80	95
Sprangletop, Bearded	60	75	20
Watergrass, Early	40	70	20
Watergrass, Late	60	60	20

Table D	Compounds		
Rate 250 g ai/ha	3	155	215
Flooded Paddy			
Barnyardgrass	0	35	0
Ducksalad	85	60	0
Flatsedge, Rice	100	60	60
Junglerice	30	40	0
Redstem	85	95	100
Rice, Transplanted	30	30	10
Rice, Water Seeded	45	35	35
Sedge, Umbrella	95	75	95
Sprangletop, Bearded	20	40	20
Watergrass, Early	20	35	0
Watergrass, Late	20	30	0

Table D	Compounds			
Rate 125 g ai/ha	3	152	155	215
Flooded Paddy				
Barnyardgrass	0	35	20	0
Ducksalad	30	90	0	0
Flatsedge, Rice	70	95	30	0
Junglerice	20	30	40	0
Redstem	40	90	0	0
Rice, Transplanted	20	45	20	0

Rice, Water Seeded	40	45	25	20
Sedge, Umbrella	80	95	75	20
Sprangletop, Bearded	0	40	30	20
Watergrass, Early	20	45	25	0
Watergrass, Late	0	40	20	0

Table D		
Rate 64 g ai/ha	152	155
Flooded Paddy		
Barnyardgrass	10	0
Ducksalad	80	0
Flatsedge, Rice	90	0
Junglerice	0	40
Redstem	85	0
Rice, Transplanted	40	0
Rice, Water Seeded	40	0
Sedge, Umbrella	85	65
Sprangletop, Bearded	35	30
Watergrass, Early	0	0
Watergrass, Late	20	0

Table D		
Rate 32 g ai/ha	152	155
Flooded Paddy		
Barnyardgrass	0	0
Ducksalad	75	0
Flatsedge, Rice	75	0
Junglerice	0	20
Redstem	60	0
Rice, Transplanted	25	0
Rice, Water Seeded	30	0
Sedge, Umbrella	75	30
Sprangletop, Bearded	30	30
Watergrass, Early	0	0
Watergrass, Late	15	0

Table D	Compound
Rate 16 g ai/ha	152
Flooded Paddy	
Barnyardgrass	0
Ducksalad	70
Flatsedge, Rice	75
Junglerice	0
Redstem	0
Rice, Transplanted	20
Rice, Water Seeded	20
Sedge, Umbrella	70
Sprangletop, Bearded	30
Watergrass, Early	0
Watergrass, Late	0

Table D	Compound
Rate 8 g ai/ha	152
Flooded Paddy	
Barnyardgrass	0
Ducksalad	0
Flatsedge, Rice	75
Junglerice	0
Redstem	0
Rice, Transplanted	0
Rice, Water Seeded	0
Sedge, Umbrella	0
Sprangletop, Bearded	30
Watergrass, Early	0
Watergrass, Late	0

<u>TEST E</u>

Seeds of plant species selected from bipinnate beggarticks (*Bidens bipinnata* L.), hairy beggarticks (*Bidens radiata* Thuill.), bermudagrass (*Cynodon dactylon* (L.) Pers.), Surinam grass (*Urochloa decumbens* (Staph) R. D. Webster, previously named *Brachiaria decumbens*

Stapf), large crabgrass (*Digitaria sanguinalis* (L.) Scop.), green foxtail (*Setaria viridis* (L.) P.Beauv.), goosegrass (*Eleusine indica* (L.) Gaertn.), johnsongrass (*Sorghum halepense* (L.) Pers.), kochia (*Kochia scoparia* (L.) Schrad.), pitted morningglory (*Ipomoea lacunosa* L.), purple nutsedge (*Cyperus rotundus* L.), common ragweed (*Ambrosia elatior* L.), mustard (*Brassica nigra* (L.) W.D.J. Koch), guineagrass (*Panicum maximum* Jacq.), dallisgrass (*Paspalum dilatatum* Poir.), barnyardgrass (*Echinochloa crus-galli* (L). P.Beauv.), southern sandbur (*Cenchrus echinatus* L.), common sowthistle (*Sonchus oleraceous* L.), prickly sida (*Sida spinosa* L.), Italian ryegrass (*Lolium multiflorum* Lam.), common purslane (*Portulaca oleracea* L.), broadleaf signalgrass (*Brachiaria platyphylla* (Griseb.) Nash), common groundsel (*Senecio vulgaris* L.), common chickweed (*Stellaria media* (L.) Vill/Cyr.), tropical spiderwort (*Commelina benghalensis* L.), annual bluegrass (Poa annua L.), downy bromegrass (*Bromus tectorum* L.), itchgrass (*Rottboellia cochinchinensis* (L.) L.f.), quackgrass (*Elytrigia repens* (L.) Nevski), Canada horseweed (*Erigeron Canadensis* L.), field bindweed (*Convolvulus arvensis* L.), spotted spurge (*Euphorbia maculata* L.), common mallow (*Malva sylvestris* (=s silvestris) L.), and Russian thistle (*Salsola kali* L. ssp. Ruthenica (Iljin) Soo) were planted and treated preemergence with test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant.

At the same time, plants selected from these weed species were treated with postemergence applications of some of the test chemicals formulated in the same manner. Plants ranged in height from 2 to 18 cm (1- to 4-leaf stage) for postemergence treatments. Treated plants and controls were maintained in a greenhouse for 12 to 14 days, after which time all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table E, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table E					Compounds					
500 g ai/ha	6	14	16	152	156	162	193	222	294	299
Postemergence										
Barnyardgrass	98	75	80	75	98	95	90	–	80	80
Beggarticks, Hip.	–	–	–	–	–	–	–	–	75	80
Bermudagrass	98	85	80	75	98	80	95	80	75	80
Bindweed, Field	100	60	40	50	100	98	50	–	70	95
Black Mustard	100	100	100	100	100	95	100	95	95	100
Bluegrass	98	90	100	85	98	98	85	90	95	100
Bromegrass, Downy	100	–	100	80	100	100	80	–	95	95
Chickweed	100	–	100	100	100	–	100	100	–	–
Crabgrass, Large	98	80	75	80	98	95	100	100	80	95
Dallisgrass	90	70	85	75	90	85	90	85	70	85
Foxtail, Green	98	80	85	85	100	95	90	–	85	100

Goosegrass	98	80	80	75	98	98	85	90	85	85
Groundsel	100	100	75	95	100	100	100	100	-	-
Guineagrass	98	100	70	80	98	98	100	-	85	85
Horseweed	100	-	-	-	100	100	90	100	-	-
Itchgrass	95	70	95	75	98	95	75	-	80	80
Johnsongrass	98	70	100	95	100	100	80	-	90	85
Kochia	100	-	-	-	100	-	-	-	-	-
Mallow	100	-	70	50	100	100	90	-	100	100
Morningglory	80	40	30	30	90	90	75	90	20	60
Nutsedge, Purple	-	70	75	75	-	-	70	-	90	85
Prickly Sida	-	75	100	85	-	-	95	100	100	95
Purslane	100	-	-	-	100	-	85	-	90	100
Quackgrass	98	60	100	80	98	95	80	85	85	100
Ragweed	95	70	80	75	98	90	75	-	80	90
Ryegrass, Italian	98	100	100	90	98	100	95	85	95	85
Sandbur	100	50	75	100	98	90	20	80	80	80
Signalgrass	98	75	70	70	98	90	80	85	70	80
Sowthistle	100	100	95	100	100	100	95	100	80	-
Spiderwort	95	80	30	80	65	65	70	-	90	90
Spurge, Spotted	-	100	-	95	-	-	-	-	-	-
Surinam Grass	98	80	75	80	100	100	90	-	85	90
Thistle	-	60	75	80	-	-	-	-	80	90

Table E	Compounds											
250 g ai/ha	2	6	13	14	16	152	156	162	193	222	294	299
Postemergence												
Barnyardgrass	95	95	70	50	70	75	98	90	80	70	75	70
Beggarticks, Bip.	-	-	-	-	-	-	-	-	-	-	70	60
Bermudagrass	90	90	90	50	80	75	95	70	90	80	75	70
Bindweed, Field	70	100	30	50	30	30	80	95	50	95	50	80
Black Mustard	100	100	90	80	100	100	100	90	95	95	90	100
Bluegrass	100	98	60	75	80	85	98	98	70	90	95	80
Bromegrass, Downy	98	100	30	30	100	75	100	98	70	80	85	80
Chickweed	-	100	95	75	95	-	100	100	95	100	-	-
Crabgrass, Large	98	98	90	70	60	75	95	90	100	90	75	95
Dallisgrass	90	80	70	50	60	75	90	70	90	85	60	75
Foxtail, Green	95	98	60	50	60	85	100	85	50	80	80	85
Goosegrass	98	98	50	60	70	60	98	95	80	90	80	80
Groundsel	80	100	85	-	75	95	100	80	70	95	90	100

Guineagrass	95	95	70	85	50	70	95	90	70	100	80	75
Horseweed	-	100	100	95	-	-	100	100	70	90	-	-
Itchgrass	90	95	75	50	60	75	95	95	60	70	75	75
Johnsongrass	100	98	30	50	70	80	100	100	70	60	80	85
Kochia	-	100	-	-	-	-	100	-	-	-	-	-
Mallow	80	100	50	70	40	50	95	80	90	60	50	50
Morningglory	90	60	60	30	10	20	80	80	60	60	20	40
Nutsedge, Purple	-	-	40	40	75	60	90	75	40	30	80	80
Prickly Sida	-	-	85	60	70	60	-	-	75	100	80	95
Purslane	-	100	70	-	-	-	100	-	60	60	90	80
Quackgrass	95	95	60	50	95	80	95	90	80	80	85	85
Ragweed	-	95	60	60	60	60	90	80	70	70	70	70
Ryegrass, Italian	98	98	75	60	95	90	98	98	95	85	95	85
Sandbur	95	100	10	10	60	40	80	80	10	50	75	70
Signalgrass	85	95	50	50	40	60	95	80	75	80	50	70
Sowthistle	95	100	100	90	95	90	100	75	95	100	-	95
Spiderwort	70	90	30	30	-	10	50	60	50	60	70	80
Spurge, Spotted	-	-	-	-	95	-	-	-	-	-	-	-
Surinam Grass	100	95	80	20	60	60	98	98	85	80	80	75
Thistle	-	-	-	-	70	80	80	-	-	-	80	70

Table E						Compounds						
125 g ai/ha	2	6	13	14	16	152	156	162	193	232	294	299
Postemergence												
Barnyardgrass	90	90	70	30	60	50	95	80	75	50	60	70
Beggarticks, Bip.	-	-	-	-	-	-	-	-	-	-	60	60
Bermudagrass	85	80	50	30	40	40	95	30	90	80	50	50
Bindweed, Field	70	95	20	30	10	30	65	80	-	75	50	70
Black Mustard	95	100	80	-	100	-	100	75	95	90	90	100
Bluegrass	98	98	30	50	20	60	95	95	50	80	95	70
Bromegrass, Downy	75	98	30	10	-	-	100	95	30	50	75	70
Chickweed	100	100	95	-	-	-	100	100	-	100	-	-
Crabgrass, Large	95	90	70	30	50	60	80	50	80	80	70	85
Dallisgrass	80	75	40	10	50	30	85	40	40	60	40	70
Foxtail, Green	90	90	20	20	40	40	95	50	20	40	60	70
Goosegrass	95	98	-	40	50	50	98	80	70	75	60	80
Groundsel	-	95	50	-	75	90	100	30	40	70	-	70
Guineagrass	75	90	40	30	50	-	90	75	60	70	70	70
Horseweed	-	100	40	-	-	-	-	70	50	40	-	-

Itchgrass	90	90	50	20	50	60	95	85	60	60	70	70
Johnsongrass	90	95	20	20	50	70	95	80	70	60	70	80
Kochia	100	100	-	-	-	-	100	-	-	-	-	-
Mallow	75	95	20	-	-	-	90	60	60	60	40	30
Morningglory	60	10	50	10	10	10	65	70	60	40	10	20
Nutsedge, Purple	-	95	20	30	50	30	75	-	20	10	70	75
Prickly Sida	-	-	70	60	60	-	-	-	60	100	70	95
Purslane	-	90	70	-	-	-	100	-	60	30	60	75
Quackgrass	90	90	30	20	50	70	95	70	70	75	80	75
Ragweed	80	90	30	20	20	50	90	75	30	60	60	60
Ryegrass, Italian	90	95	40	50	80	90	95	95	60	80	80	90
Sandbur	75	95	10	10	30	20	75	50	0	10	50	40
Signalgrass	80	90	10	10	20	20	85	70	50	40	30	60
Sowthistle	90	95	60	90	70	-	90	75	60	60	60	85
Spiderwort	-	75	30	-	-	-	30	10	20	40	30	80
Spurge, Spotted	-	-	-	20	95	-	-	-	-	-	-	-
Surinam Grass	90	90	30	20	60	30	95	90	70	80	70	75
Thistle	-	-	-	10	60	70	80	-	-	-	60	70

Table E				Compounds					
62 g ai/ha	2	6	13	156	162	193	222	294	299
Postemergence									
Barnyardgrass	80	80	10	90	60	10	50	40	40
Beggarticks, Bip.	-	-	-	-	-	-	-	40	40
Bermudagrass	20	35	50	65	0	60	60	20	40
Bindweed, Field	50	10	10	65	50	20	60	10	30
Black Mustard	90	95	70	98	60	60	90	70	100
Bluegrass	90	98	10	90	90	20	60	95	60
Bromegrass, Downy	65	95	10	90	50	20	10	60	50
Chickweed	-	100	50	100	80	40	80	-	-
Crabgrass, Large	90	75	50	35	30	10	60	40	75
Dallisgrass	75	60	10	75	20	10	30	10	50
Foxtail, Green	60	80	10	75	30	10	10	40	30
Goosegrass	95	90	50	95	50	20	60	50	60
Groundsel	-	20	30	80	20	20	40	50	-
Guineagrass	30	80	40	60	35	20	70	50	60
Horseweed	-	75	-	-	70	50	20	-	-
Itchgrass	70	90	50	80	75	30	60	50	30
Johnsongrass	80	90	0	85	65	40	10	40	60

Kochia	-	100	-	-	-	-	-	-	-
Mallow	50	65	10	80	40	20	50	20	10
Morningglory	-	0	20	10	30	30	20	0	10
Nutsedge, Purple	-	75	0	-	-	0	10	50	40
Prickly Sida	-	-	60	-	-	60	90	50	60
Purslane	-	75	30	75	-	20	10	10	70
Quackgrass	70	80	0	75	50	0	30	60	20
Ragweed	60	75	20	80	50	10	20	30	30
Ryegrass, Italian	80	80	10	90	50	30	50	70	60
Sandbur	65	85	0	0	20	0	10	10	30
Signalgrass	30	35	10	40	30	10	10	30	20
Sowthistle	90	75	50	90	75	10	20	60	30
Spiderwort	20	60	-	20	0	-	-	20	10
Surinam Grass	75	75	20	80	50	10	50	30	70
Thistle	-	-	-	-	-	-	-	30	40

Table E	Compound	Table E	Compound	Table E	Compound
31 g ai/ha	13	31 g ai/ha	13	31 g ai/ha	13
Postemergence		Goosegrass	10	Purslane	20
Barnyardgrass	0	Groundsel	20	Quackgrass	0
Bermudagrass	20	Guineagrass	40	Ragweed	20
Bindweed, Field	10	Horseweed	10	Ryegrass, Italian	0
Black Mustard	70	Itchgrass	30	Sandbur	0
Bluegrass	10	Johnsongrass	0	Signalgrass	10
Bromegrass, Downy	0	Mallow	0	Sowthistle	10
Crabgrass, Large	30	Morningglory	10	Spiderwort	10
Dallisgrass	0	Nutsedge, Purple	0	Surinam Grass	20
Foxtail, Green	10	Prickly Sida	40		

Table E	Compounds													
500 g ai/ha	2	6	7	14	16	144	152	156	162	193	222	268	293	294
Preemergence														
Barnyardgrass	100	100	70	95	95	90	90	100	100	95	100	100	100	100
Beggarticks, Hairy	-	-	40	-	-	-	-	-	-	-	-	100	100	100
Bermudagrass	100	100	80	95	100	90	95	100	100	100	100	100	95	95
Bindweed, Field	80	100	30	100	75	80	90	100	100	85	95	70	95	100
Black Mustard	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Bluegrass	100	100	80	100	100	100	95	100	100	100	100	95	100	100
Bromegrass, Downy	90	100	60	90	95	80	90	100	100	90	100	100	80	100

Chickweed	95	100	-	95	100	95	100	100	95	100	100	-	-	-
Crabgrass, Large	100	100	100	100	100	60	100	95	100	100	100	95	100	100
Dallisgrass	95	100	85	95	95	80	95	100	95	100	100	85	100	95
Foxtail, Green	100	100	50	100	100	90	100	100	100	100	100	100	100	100
Goosegrass	95	100	70	95	85	80	90	100	95	95	95	95	100	100
Groundsel	100	100	-	100	100	100	100	100	100	100	100	-	-	-
Guineagrass	100	100	100	95	80	80	100	100	100	100	100	100	100	100
Horseweed	100	100	-	-	-	100	-	100	100	100	100	-	-	-
Itchgrass	95	95	70	95	85	75	80	100	100	100	95	95	100	100
Johnsongrass	100	100	70	95	80	60	85	100	100	95	100	80	85	85
Kochia	100	100	85	100	100	90	95	100	95	100	100	-	-	-
Mallow	80	100	70	95	95	95	90	100	100	95	95	90	85	80
Morningglory	80	100	10	70	40	100	40	100	100	70	95	60	90	70
Nutsedge, Purple	95	100	100	75	80	50	60	95	-	80	80	85	60	90
Prickly Sida	-	-	20	100	95	95	95	-	-	95	100	100	100	100
Purslane	100	100	20	100	95	100	100	100	100	100	100	-	-	-
Quackgrass	80	100	50	95	90	80	60	100	90	95	100	95	95	95
Ragweed	85	95	50	95	95	40	80	100	95	95	95	100	100	100
Ryegrass, Italian	95	100	40	95	95	95	95	100	95	100	100	95	100	100
Sandbur	100	100	40	80	85	60	80	80	80	60	95	100	100	100
Signalgrass	90	95	40	95	70	50	80	95	100	95	95	80	100	80
Sowthistle	95	100	95	95	95	95	95	100	95	95	95	100	100	100
Spiderwort	100	95	60	90	70	100	80	80	75	95	95	90	90	95
Spurge, Spotted	-	-	-	100	100	-	100	-	-	-	-	-	-	-
Surinam Grass	90	100	60	100	90	70	80	95	100	100	100	100	100	100
Thistle	80	80	10	100	80	-	100	100	70	-	-	100	100	100

Table E	Compound
500 g ai/ha	299
Preemergence	
Barnyardgrass	100
Beggarticks, Hairy	100
Bermudagrass	100
Bindweed, Field	95
Black Mustard	100
Bluegrass	95
Bromegrass, Downy	100
Crabgrass, Large	100
Dallisgrass	100

Table E	Compounds	
375 g ai/ha	293	294
Preemergence		
Barnyardgrass	100	100
Beggarticks, Hairy	100	100
Bermudagrass	95	95
Bindweed, Field	95	95
Black Mustard	100	100
Bluegrass	95	95
Bromegrass, Downy	-	100
Crabgrass, Large	100	100
Dallisgrass	95	95

Foxtail, Green	100
Goosegrass	100
Guineagrass	100
Itchgrass	100
Johnsongrass	100
Mallow	100
Prickly Sida	100
Quackgrass	100
Ragweed	100
Ryegrass, Italian	100
Sandbur	100
Signalgrass	100
Sowthistle	100
Spiderwort	95
Surinam Grass	100
Thistle	100

Foxtail, Green	95	100
Goosegrass	95	100
Guineagrass	100	100
Itchgrass	100	95
Johnsongrass	70	85
Mallow	80	-
Morningglory	50	40
Nutsedge, Purple	50	80
Prickly Sida	100	100
Quackgrass	95	95
Ragweed	100	100
Ryegrass, Italian	95	100
Sandbur	100	95
Signalgrass	95	80
Sowthistle	95	100
Spiderwort	80	90
Surinam Grass	100	100
Thistle	95	100

Table E	Compounds													
250 g ai/ha	2	6	7	13	14	16	144	152	156	162	193	222	268	293
Preemergence														
Barnyardgrass	100	95	60	90	85	80	80	85	100	100	85	100	100	100
Beggarticks, Hairy	-	-	20	-	-	-	-	-	-	-	-	-	100	100
Bermudagrass	100	95	80	100	95	90	85	95	100	90	100	100	95	95
Bindweed, Field	70	-	10	60	75	50	50	60	100	100	80	95	40	60
Black Mustard	100	100	50	100	100	85	75	95	100	80	100	100	100	100
Bluegrass	100	-	75	90	95	95	100	95	100	100	100	100	95	95
Bromegrass, Downy	90	95	60	50	80	85	60	60	100	90	80	90	80	80
Chickweed	95	95	-	95	95	95	95	100	100	95	100	100	-	-
Crabgrass, Large	100	-	75	100	100	90	50	100	95	95	100	100	95	95
Dallisgrass	95	95	80	80	95	90	60	85	100	95	95	100	85	95
Foxtail, Green	100	-	30	95	100	80	80	85	100	100	80	100	100	95
Goosegrass	95	-	40	90	90	85	80	80	100	95	90	90	95	90
Groundsel	100	-	-	100	100	100	100	100	100	80	100	100	-	-
Guineagrass	100	95	60	90	95	80	60	80	100	100	100	100	100	100
Horseweed	100	100	-	100	-	-	100	-	100	100	100	100	-	-
Itchgrass	90	-	40	60	85	75	70	75	100	95	80	95	75	90

Johnsongrass	100	90	20	80	95	75	60	80	100	100	85	90	50	60
Kochia	100	100	80	75	95	70	90	85	100	95	100	100	-	-
Mallow	50	-	60	50	95	85	70	90	100	100	95	95	80	50
Morningglory	60	-	10	50	60	30	20	40	100	85	50	40	40	40
Nutsedge, Purple	-	100	30	60	60	70	30	50	-	-	50	70	85	40
Prickly Sida	-	-	0	-	85	90	90	60	-	-	70	100	100	80
Purslane	100	100	0	100	100	95	90	50	100	100	100	100	-	-
Quackgrass	70	-	30	60	90	80	70	50	95	75	70	100	95	80
Ragweed	70	-	20	80	95	70	40	80	95	75	80	95	100	70
Ryegrass, Italian	95	-	40	60	85	95	80	80	100	95	100	100	95	95
Sandbur	80	-	30	20	40	80	30	70	75	80	20	70	100	100
Signalgrass	75	-	30	70	95	60	30	70	90	100	70	95	80	95
Sowthistle	95	100	95	95	95	90	90	95	100	80	95	90	100	95
Spiderwort	70	80	20	50	80	60	60	75	50	75	90	-	85	80
Spurge, Spotted	-	-	-	-	100	100	-	100	-	-	-	-	-	-
Surinam Grass	80	-	30	90	95	80	50	70	95	95	90	100	100	100
Thistle	60	70	10	-	60	50	-	40	100	60	-	-	100	80

Table E	Compounds	
250 g ai/ha	294	299
Preemergence		
Barnyardgrass	95	95
Beggarticks, Hairy	100	100
Bermudagrass	95	100
Bindweed, Field	90	95
Black Mustard	100	100
Bluegrass	95	95
Bromegrass, Downy	100	100
Chickweed	-	-
Crabgrass, Large	95	100
Dallisgrass	80	100
Foxtail, Green	100	100
Goosegrass	95	100
Groundsel	-	-
Guineagrass	100	100
Horseweed	-	-
Itchgrass	75	90
Johnsongrass	75	80

Table E	Compounds	
250 g ai/ha	294	299
Preemergence		
Kochia	-	-
Mallow	40	95
Morningglory	10	90
Nutsedge, Purple	80	80
Prickly Sida	100	100
Purslane	-	-
Quackgrass	80	95
Ragweed	85	90
Ryegrass, Italian	100	100
Sandbur	80	100
Signalgrass	70	100
Sowthistle	95	100
Spiderwort	85	95
Spurge, Spotted	-	-
Surinam Grass	100	95
Thistle	100	100

Table E	Compounds													
125 g ai/ha	2	6	7	13	14	16	144	152	156	162	193	222	268	293
Preemergence														
Barnyardgrass	80	95	30	80	80	80	60	75	100	100	75	90	85	60
Beggarticks, Hairy	-	-	10	-	-	-	-	-	-	-	-	-	95	100
Bermudagrass	95	95	50	95	95	90	80	90	100	80	100	100	90	90
Bindweed, Field	-	60	10	30	75	50	-	20	90	80	50	40	20	40
Black Mustard	100	100	30	100	75	85	70	90	100	50	100	100	100	95
Bluegrass	100	100	60	60	95	95	90	80	95	100	100	100	95	95
Bromegrass, Downy	90	95	10	30	30	70	50	30	80	80	30	90	80	-
Chickweed	90	95	-	90	95	95	90	95	100	95	100	100	-	-
Crabgrass, Large	80	90	60	80	95	50	40	70	90	90	80	100	80	95
Dallisgrass	90	95	40	75	85	80	30	80	95	95	95	80	80	60
Foxtail, Green	80	95	10	30	75	60	50	70	100	85	30	50	95	50
Goosegrass	90	95	40	80	90	80	50	70	95	90	80	75	80	90
Groundsel	70	100	-	100	80	20	100	100	100	40	100	100	-	-
Guineagrass	80	95	40	60	90	60	20	50	100	100	70	95	85	100
Horseweed	100	100	-	100	-	-	100	-	100	100	100	100	-	-
Itchgrass	70	95	30	50	70	50	70	60	100	95	70	95	60	10
Johnsongrass	90	90	10	50	70	70	50	50	100	100	75	80	50	10
Kochia	100	100	0	70	95	70	60	85	100	70	100	100	-	-
Mallow	-	100	60	50	85	60	60	80	100	70	95	80	50	40
Morningglory	50	70	10	50	30	20	20	10	100	60	30	30	10	10
Nutsedge, Purple	-	100	0	30	50	70	30	20	-	-	30	40	70	-
Prickly Sida	-	-	0	-	75	90	90	20	-	-	70	70	80	-
Purslane	100	100	0	60	100	95	20	0	100	100	60	100	-	-
Quackgrass	80	100	20	20	50	70	30	20	90	60	60	80	85	70
Ragweed	60	80	20	20	60	50	30	60	90	60	50	85	60	50
Ryegrass, Italian	80	95	40	40	70	90	60	50	95	95	90	100	95	60
Sandbur	70	100	20	0	40	70	30	30	60	70	10	40	70	10
Signalgrass	70	75	20	30	60	60	20	40	-	70	60	60	60	50
Sowthistle	95	95	60	90	90	60	50	80	100	60	95	90	100	75
Spiderwort	60	75	10	50	60	10	60	20	50	40	80	-	70	60
Spurge, Spotted	-	-	-	-	100	100	-	100	-	-	-	-	-	-
Surinam Grass	80	90	-	60	90	75	50	50	75	75	80	90	90	80
Thistle	60	70	10	-	60	50	-	20	100	50	-	-	60	60

Table E 125 g ai/ha Preemergence	Compounds 294	299
Barnyardgrass	95	85
Beggarticks, Hairy	100	100
Bermudagrass	90	100
Bindweed, Field	10	60
Black Mustard	100	100
Bluegrass	95	95
Bromegrass, Downy	80	–
Chickweed	–	–
Crabgrass, Large	75	100
Dallisgrass	75	85
Foxtail, Green	80	100
Goosegrass	95	100
Groundsel	–	–
Guineagrass	90	85
Horseweed	–	–
Itchgrass	–	75
Johnsongrass	30	60

Table E 125 g ai/ha Preemergence	Compounds 294	299
Kochia	–	–
Mallow	40	75
Morningglory	10	75
Nutsedge, Purple	80	–
Prickly Sida	100	85
Purslane	–	–
Quackgrass	80	80
Ragweed	75	85
Ryegrass, Italian	80	95
Sandbur	70	60
Signalgrass	50	80
Sowthistle	80	100
Spiderwort	–	85
Spurge, Spotted	–	–
Surinam Grass	95	95
Thistle	50	100

Table E	Compounds													
62 g ai/ha	2	6	7	13	14	16	144	152	156	162	193	222	268	299
Preemergence														
Barnyardgrass	60	90	0	30	60	70	30	60	100	60	20	50	60	60
Beggarticks, Hairy	–	–	0	–	–	–	–	–	–	–	–	–	40	50
Bermudagrass	90	90	10	80	90	80	50	70	95	70	65	80	60	80
Bindweed, Field	10	30	0	30	60	0	0	10	60	30	50	–	0	10
Black Mustard	60	100	10	70	60	80	20	90	100	20	80	90	90	100
Bluegrass	95	100	0	50	50	90	80	60	95	100	80	90	80	85
Bromegrass, Downy	50	90	0	0	20	10	20	0	60	40	10	30	–	–
Chickweed	90	90	–	90	90	70	50	90	80	–	80	80	–	–
Crabgrass, Large	70	80	20	60	95	20	0	40	–	50	60	70	70	90
Dallisgrass	60	90	40	50	40	50	0	50	90	70	40	50	70	75
Foxtail, Green	40	95	0	10	30	60	10	20	100	30	10	10	70	50
Goosegrass	80	85	0	50	70	60	20	30	95	60	30	60	70	100
Groundsel	60	100	–	70	80	–	10	95	100	10	20	30	–	–
Guineagrass	70	95	0	20	60	20	10	20	90	50	60	90	70	70

Horseweed	80	100	-	80	-	-	70	-	95	100	80	100	-	-
Itchgrass	60	90	0	20	10	50	20	20	100	40	20	75	50	60
Johnsongrass	90	90	0	0	30	40	30	30	95	60	20	70	30	40
Kochia	90	100	0	30	10	60	0	0	100	60	100	30	-	-
Mallow	30	70	0	50	60	60	60	40	70	50	60	70	50	50
Morningglory	30	20	0	0	10	0	0	10	30	30	0	-	10	10
Nutsedge, Purple	-	60	0	0	20	60	0	0	-	0	0	10	50	50
Prickly Sida	-	-	0	-	30	40	10	20	-	-	20	20	60	85
Purslane	-	100	0	40	100	0	0	0	100	100	-	70	-	-
Quackgrass	30	95	20	0	30	40	10	10	50	20	10	10	40	80
Ragweed	20	50	0	10	30	20	0	20	50	20	50	30	50	20
Ryegrass, Italian	60	90	0	10	30	60	10	20	60	50	30	50	95	70
Sandbur	60	85	0	0	10	10	10	10	50	20	0	0	10	10
Signalgrass	50	75	0	10	20	10	10	10	85	-	10	10	20	60
Sowthistle	90	95	0	80	30	60	10	80	60	40	80	75	80	100
Spiderwort	20	70	0	10	60	10	60	10	30	30	10	60	50	75
Spurge, Spotted	-	-	-	-	90	100	-	-	-	-	-	-	-	-
Surinam Grass	60	85	-	20	40	60	10	20	50	60	10	50	60	50
Thistle	50	50	0	-	10	10	-	20	80	50	-	-	60	100

Table E	Compound	Table E	Compound	Table E	Compound
31 g ai/ha	13	31 g ai/ha	13	31 g ai/ha	13
Preemergence		Foxtail, Green	0	Quackgrass	0
Barnyardgrass	0	Goosegrass	10	Ragweed	0
Bermudagrass	40	Guineagrass	0	Ryegrass, Italian	0
Bindweed, Field	0	Itchgrass	0	Sandbur	0
Black Mustard	30	Johnsongrass	0	Signalgrass	10
Bluegrass	0	Kochia	10	Sowthistle	30
Bromegrass, Downy	0	Mallow	40	Spiderwort	0
Chickweed	40	Morningglory	0	Surinam Grass	0
Crabgrass, Large	0	Nutsedge, Purple	0		
Dallisgrass	0	Purslane	40		

TEST F

Seeds of plant species selected from annual bluegrass (*Poa annua* L.), blackgrass (*Alopecurus myosuroides* Huds.), catchweed bedstraw (*Gallium aparine* L.), common chickweed (*Stellaria media* (L.) Vill./Cyr.), downy bromegrass (*Bromus tectorum* L.), green foxtail (*Setaria viridis* (L.) Beauv.), Italian ryegrass (*Lolium multiflorum* Lam.), kochia (*Kochia scoparia* (L.) Schrad.), lambsquarters (*Chenopodium album* L.), littleseed

canarygrass (*Phalaris minor* Retz.), pigweed (*Amaranthus retroflexus* L.), Russian thistle (*Salsola kali* L. ssp. Ruthenica (Iljin) Soo), wild buckwheat (*Polygonum convolvulus* L.), wild mustard (*Sinapis arvensis* L.), wild oat (*Avena fatua* L.), windgrass (*Apera spica-venti* (L.) Beauv.), winter barley (*Hordeum vulgare* L.), and wheat (*Triticum aestivum* L.) were planted and treated preemergence with test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant.

At the same time, plants selected from these crop and weed species were treated with postemergence applications of some of the test chemicals formulated in the same manner. Plants ranged in height from 2 to 18 cm (1- to 4-leaf stage) for postemergence treatments. Treated plants and controls were maintained in a greenhouse for 12 to 14 days, after which time all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table F, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table F	Compound
500 g ai/ha	162
Postemergence	
Barley, Winter	80
Blackgrass	100
Bluegrass	100
Bromegrass, Downy	90
Canarygrass	100
Chickweed	100
Foxtail, Green	100
Kochia	100
Lambsquarters	100
Mustard, Wild	100
Oat, Wild	100
Pigweed	100
Ryegrass, Italian	100
Wheat	70

Table F	Compounds		
250 g ai/ha	9	162	248
Postemergence			
Barley, Winter	75	80	40
Blackgrass	95	100	60
Bluegrass	80	90	70
Bromegrass, Downy	65	80	40
Buckwheat, Wild	60	–	60
Canarygrass	65	100	45
Chickweed	60	100	100
Foxtail, Green	50	60	65
Galium	65	–	60
Kochia	90	100	65
Lambsquarters	90	100	60
Mustard, Wild	90	100	60
Oat, Wild	65	100	65
Pigweed	95	100	70
Ryegrass, Italian	80	90	65
Thistle	65	–	40
Wheat	65	50	20
Windgrass	80	–	50

Table F	Compounds			
125 g ai/ha	9	162	223	248
Postemergence				
Barley, Winter	30	50	0	30
Blackgrass	70	80	60	60
Bluegrass	70	60	50	60
Bromegrass, Downy	60	50	20	40
Buckwheat, Wild	60	–	40	50
Canarygrass	40	70	40	40
Chickweed	60	80	60	98
Foxtail, Green	40	50	60	60
Galium	45	–	60	60
Kochia	65	100	75	65
Lambsquarters	90	100	65	60
Mustard, Wild	90	80	65	60
Oat, Wild	45	80	35	60
Pigweed	90	90	65	70
Ryegrass, Italian	65	80	45	60
Thistle	60	–	60	30
Wheat	0	40	0	5
Windgrass	50	–	50	50

Table F	Compounds		
62 g ai/ha	9	162	248
Postemergence			
Barley, Winter	20	40	30
Blackgrass	40	70	50
Bluegrass	50	60	50
Bromegrass, Downy	30	50	40
Buckwheat, Wild	60	–	50
Canarygrass	0	70	40
Chickweed	30	70	65
Foxtail, Green	40	50	60
Galium	40	–	50
Kochia	65	100	60
Lambsquarters	80	100	60
Mustard, Wild	65	60	40
Oat, Wild	35	70	45
Pigweed	65	70	65
Ryegrass, Italian	60	70	55
Thistle	30	–	30
Wheat	0	20	5
Windgrass	30	–	50

Table F	Compound
31 g ai/ha	248
Postemergence	
Barley, Winter	25
Blackgrass	45
Bluegrass	50
Bromegrass, Downy	40
Buckwheat, Wild	50
Canarygrass	35
Chickweed	65
Foxtail, Green	50
Galium	50
Kochia	60
Lambsquarters	35
Mustard, Wild	30
Oat, Wild	45

Table F	Compound
500 g ai/ha	162
Preemergence	
Barley, Winter	100
Blackgrass	100
Bluegrass	100
Bromegrass, Downy	100
Canarygrass	100
Chickweed	100
Foxtail, Green	100
Galium	100
Kochia	100
Lambsquarters	100
Mustard, Wild	100
Oat, Wild	100
Pigweed	100

Pigweed	65
Ryegrass, Italian	45
Thistle	25
Wheat	0
Windgrass	50

Ryegrass, Italian	100
Wheat	100

Table F	Compounds		
250 g ai/ha	9	162	248
Preemergence			
Barley, Winter	75	100	35
Blackgrass	100	100	65
Bluegrass	100	100	100
Bromegrass, Downy	75	100	65
Buckwheat, Wild	100	-	60
Canarygrass	75	100	75
Chickweed	100	100	100
Foxtail, Green	100	100	100
Galium	30	100	60
Kochia	100	100	100
Lambsquarters	100	100	100
Mustard, Wild	100	100	50
Oat, Wild	75	100	65
Pigweed	100	100	95
Ryegrass, Italian	100	100	60
Thistle	100	-	45
Wheat	65	100	10
Windgrass	100	-	100

Table F	Compounds			
125 g ai/ha	9	162	223	248
Preemergence				
Barley, Winter	65	100	25	0
Blackgrass	100	100	70	65
Bluegrass	100	100	100	100
Bromegrass, Downy	70	100	50	50
Buckwheat, Wild	100	-	55	45
Canarygrass	60	100	50	-
Chickweed	100	100	100	100
Foxtail, Green	100	100	55	100
Galium	30	70	50	50
Kochia	100	100	75	65
Lambsquarters	100	100	95	100
Mustard, Wild	100	80	100	50
Oat, Wild	65	100	70	50
Pigweed	100	100	100	95
Ryegrass, Italian	95	100	65	50
Thistle	65	-	60	30
Wheat	60	100	0	0
Windgrass	100	-	100	100

Table F	Compounds		
62 g ai/ha	9	162	248
Preemergence			
Barley, Winter	0	70	0
Blackgrass	70	90	50
Bluegrass	85	100	70
Bromegrass, Downy	60	70	45
Buckwheat, Wild	60	-	40
Canarygrass	50	100	45
Chickweed	100	100	100
Foxtail, Green	70	70	65

Table F	Compound
31 g ai/ha	248
Preemergence	
Barley, Winter	0
Blackgrass	50
Bluegrass	70
Bromegrass, Downy	35
Buckwheat, Wild	30
Canarygrass	40
Chickweed	100
Foxtail, Green	65

Galium	30	60	50	Galium	30
Kochia	60	60	60	Kochia	50
Lambsquarters	100	100	40	Lambsquarters	40
Mustard, Wild	100	80	50	Mustard, Wild	40
Oat, Wild	45	100	45	Oat, Wild	40
Pigweed	100	90	75	Pigweed	70
Ryegrass, Italian	65	100	50	Ryegrass, Italian	30
Thistle	45	–	30	Thistle	30
Wheat	0	60	0	Wheat	0
Windgrass	80	–	70	Windgrass	70

TEST G

This test evaluated the safening of compounds of the invention on corn (maize; *Zea mays* L.) cv. 'Pioneer 33G26' by seed treatment with naphthalic anhydride (1,8-naphthalic anhydride). All corn seed had been first treated with fludioxonil and metaxyl applied at the manufacturer's recommended rate as per the Pioneer 33G26 label. Some of the corn seed were subsequently also treated with naphthalic anhydride as a 1% by weight seed dressing. The corn seed were planted in pots containing pasteurized Sassafras sandy loam soil, and then treatments were applied preemergence the same day. Treatments were applied by spraying the test compounds formulated in a non-phytotoxic solvent mixture, using a flat fan nozzle and a spray volume of 280 L/ha. The treatments were triply replicated and the results subsequently averaged. The pots were placed on a greenhouse bench using a complete randomized block design except for the first replicate, which was unrandomized. The plants were grown in the greenhouse and watered as needed with a dilute nutrient solution containing 200 ppm of N. Illumination was daylight supplemented by artificial sources to maintain a photoperiod of 16 hours. The temperature was maintained at 28 ± 2 °C during the day and 23 ± 2 °C at night. The plant response was visually rated 25 days after treatment in comparison to untreated controls using a scale of 0 to 100, with 0 representing no effect and 100 representing complete plant death. The results are listed in Table G.

Table G – Results from using naphthalic anhydride to safen compounds of the invention on corn

Treatment	Application Rate (g a.i./ha)	Without naphthalic anhydride seed treatment	With 1% naphthalic anhydride seed treatment
Only spray solvent	0	0	0
Compound 2	62	65	50
	125	72	55
	250	78	68
	500	85	72
Compound 6	62	65	60
	125	68	62
	250	88	78
	500	92	70
Compound 156	62	2	0
	125	30	0
	250	65	17
	500	88	17
Compound 162	62	15	0
	125	30	25
	250	68	60
	500	85	63

TEST H

This test evaluated the safening of compounds of the invention on wheat (*Triticum aestivum* L.) cv. 'Recital' by seed treatment with naphthalic anhydride. Some of the wheat seed was treated with naphthalic anhydride as a 1% by weight seed dressing. The wheat seed were planted in pots containing pasteurized Sassafras sandy loam soil. For postemergence testing the plants were grown 8 days to the 2-leaf stage at time of treatment. Preemergence treatments were applied the same day that the seeds were planted. Treatments were applied by spraying the test compounds formulated in a non-phytotoxic solvent mixture, using a flat fan nozzle and a spray volume of 280 L/ha. The preemergence treatments were triply replicated and the results subsequently averaged. The pots were placed on a growth chamber bench using a complete randomized block design for the preemergence test except for the first replicate, which was unrandomized. The plants were grown in the growth chamber and watered as needed with a dilute nutrient solution containing 200 ppm of N. Illumination was provided by fluorescent lamps giving 200–300 $\mu E/m^2/S$ of photosynthetically active radiation over a 14-hour photoperiod. The temperature

was maintained at 23 ± 2 °C during the day and 17 ± 2 °C at night. The effects of the treatments were rated 25 days after preemergence treatment and 14 days after postemergence treatment. The plant response was visually rated in comparison to untreated controls using a scale of 0 to 100, with 0 representing no effect and 100 representing complete plant death. The results for the compounds tested preemergence are listed in Table H1, and the results for the compounds tested postemergence are listed in Table H2.

Table H1 – Results from using naphthalic anhydride to safen compounds of the invention applied preemergence to wheat

Treatment	Application Rate (g a.i./ha)	Without naphthalic anhydride seed treatment	With 1% naphthalic anhydride seed treatment
Only spray solvent	0	0	0
Compound 2	62	62	50
	125	82	72
Compound 6	62	99	77
	125	100	100
Compound 156	62	67	7
	125	100	70
	250	100	85
	500	100	99
Compound 162	62	60	47
	125	98	62
	250	98	96

Table H2 – Results from using naphthalic anhydride to safen compounds of the invention applied postemergence to wheat

Treatment	Application Rate (g a.i./ha)	Without naphthalic anhydride seed treatment	With 1% naphthalic anhydride seed treatment
Only spray solvent	0	0	0
Compound 2	62	60	30
	125	75	65
Compound 6	62	75	65
	125	75	75
Compound 162	62	5	5
	125	70	30

TEST I

This test evaluated the safening of Compound 6 on barley (*Hordeum vulgare* L.) cv. 'Boone' and wheat (*Triticum aestivum* L.) cv. 'Recital' by Harmony® Extra Herbicide, which comprises 50 wt% thifensulfuron-methyl and 25 wt% tribenuron-methyl. Barley and wheat seeds were planted in pots containing a pasteurized blend of Matapeake soil and sand. For postemergence testing the plants were grown 10 days so the barley seedlings were at the 2-leaf stage and the wheat seedlings were at the 2–3-leaf stage at time of treatment. Preemergence treatments were applied the day after the seeds were planted. Treatments were applied by spraying Compound 6 and/or Harmony® Express in a non-phytotoxic solvent mixture, using flat fan nozzle and a spray volume of 280 L/ha. The treatments were triply replicated and the results subsequently averaged. The pots were placed on a greenhouse bench using a complete randomized block design except for the first replicate, which was unrandomized. The plants were grown in the greenhouse and watered as needed with a dilute nutrient solution containing 200 ppm of N. Illumination was daylight supplemented by artificial sources to maintain a photoperiod of 14 hours. The temperature was maintained at 23 ± 2 °C during the day and 17 ± 2 °C at night. The effects of the treatments were rated 25 days after preemergence treatment and 15 days after postemergence treatment. The plant response was visually rated in comparison to untreated controls using a scale of 0 to 100, with 0 representing no effect and 100 representing complete plant death.

Colby's Equation was used to calculate the expected additive herbicidal effect of the mixtures of Compound 6 with Harmony® Extra (i.e. a 2:1 mixture by weight of thifensulfuron-methyl and tribenuron-methyl). Colby's Equation (Colby, S. R. "Calculating Synergistic and Antagonistic Responses of Herbicide Combinations," *Weeds*, 15(1), pp 20–22 (1967)) calculates the expected additive effect of herbicidal mixtures, and for two active ingredients is of the form:

$$P_{a+b} = P_a + P_b - (P_a P_b / 100)$$

wherein P_{a+b} is the percentage effect of the mixture expected from additive contribution of the individual components,

P_a is the observed percentage effect of the first active ingredient at the same use rate as in the mixture, and

P_b is the observed percentage effect of the second active ingredient at the same use rate as in the mixture.

The results and additive effects expected from Colby's Equation for the preemergence test are listed in Table I1, and the results and additive effects expected from Colby's Equation for the postemergence test are listed in Table I2.

Table I1 – Results from using Harmony® Extra Herbicide to safen Compound 6 applied preemergence to barley and wheat

Compound 6 (g a.i./ha)	Thifensulfuron-methyl (g a.i./ha)	Tribenuron-methyl (g a.i./ha)	Barley		Wheat	
			Observed	Expected*	Observed	Expected*
0	5.3	2.7	0	–	0	–
0	10.7	5.3	5	–	5	–
16	0	0	35	–	45	–
16	5.3	2.7	35	35	13	45
16	10.7	5.3	13	38	7	48
31	0	0	68	–	67	–
31	5.3	2.7	65	68	55	67
31	10.7	5.3	48	70	40	68

* Effects expected from Colby's Equation.

Table I2 – Results from using Harmony® Extra Herbicide to safen Compound 6 applied postemergence to barley and wheat

Compound 6 (g a.i./ha)	Thifensulfuron-methyl (g a.i./ha)	Tribenuron-methyl (g a.i./ha)	Barley		Wheat	
			Observed	Expected*	Observed	Expected*
0	5.3	2.7	0	–	0	–
0	10.7	5.3	7	–	8	–
16	0	0	47	–	58	–
16	5.3	2.7	40	47	45	58
16	10.7	5.3	33	50	43	62
31	0	0	73	–	65	–
31	5.3	2.7	68	73	58	65
31	10.7	5.3	63	75	43	68

* Effects expected from Colby's Equation.

TEST J

Seeds of test plants consisting of barnyardgrass (ECHCG; *Echinochloa crus-galli* (L.) Beauv.), blackgrass (ALOMY; *Alopecurus myosuroides* Huds.), Surinam grass (BRADC; *Urochloa decumbens* (Staph) R. D. Webster, previously named *Brachiaria decumbens* Stapf), cocklebur (XANST, *Xanthium strumarium* L.), corn (ZEAMD, *Zea mays* L. cv. 'Pioneer 33G26'), large crabgrass (DIGSA, *Digitaria sanguinalis* (L.) Scop.), giant foxtail (SETFA, *Setaria faberi* Herrm.), lambsquarters (CHEAL, *Chenopodium album* L.), morningglory (IPOCO, *Ipomoea coccinea* L.), pigweed (AMARE, *Amaranthus retroflexus*

L.), velvetleaf (ABUTH, *Abutilon theophrasti* Medik.) wheat (TRZAS, *Triticum aestivum* L. cv. 'Recital') and wild oat (AVEFA, *Avena fatua* L.) were planted in Redi-Earth® planting medium (Scotts Company, 14111 Scottslawn Road, Marysville, Ohio 43041) comprising spaghnum peat moss and vermiculite. Seeds of small-seeded species were planted about 1 cm deep; larger seeds were planted about 2.5 cm deep. Plants were grown in a greenhouse using supplemental lighting to maintain a photoperiod of about 14 hours; daytime and nighttime temperatures were about 24–30 °C and 22–25 °C, respectively. Balanced fertilizer was applied through the watering system. The plants were grown for 7 to 11 days so that at time of treatment the plants ranged in height from 2 to 18 cm (1- to 4-leaf stage). Treatments consisted of Compounds 2 and 6 (technical material), atrazine (90DF), terbacil (Sinbar® 80DF), hexazinone (Velpar® 75WG), diuron (Karmex® 80WP) and paraquat (Gramoxone® Extra, 37%) alone and in combination, suspended or dissolved in an aqueous solvent comprising a nonionic surfactant and applied as a foliage spray using a volume of 541 L/ha. Each treatment was triply replicated. The application solvent was observed to have no effect compared to untreated check plants. Treated plants and controls were maintained in the greenhouse and watered as needed with care to not wet the foliage for the first 24 hours after treatment. The effects on the plants 15 days after treatment were visually compared to untreated controls. Plant response ratings, listed in Table J as the means of the three replicates, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. Also listed in Table J are the expected effects for the mixtures calculated using Colby's Equation.

Table J– Observed and Expected Results from Compounds 2 and 6 Alone and in Combination with Atrazine, Diuron, Hexazinone, Terbacil and Paraquat*

Application Rate (g a.i./ha)			DIGSA		BRADC		CHEAL		AMARE		SETFA	
			Obsd.	Exp.	Obsd.	Exp.	Obsd.	Exp.	Obsd.	Exp.	Obsd.	Exp.
–	Atrazine	125	5	–	15	–	67	–	38	–	0	–
–	Atrazine	250	5	–	5	–	95	–	75	–	18	–
–	Diuron	250	68	–	68	–	98	–	95	–	35	–
–	Diuron	500	63	–	85	–	100	–	100	–	67	–
–	Hexazinone	100	38	–	62	–	78	–	88	–	28	–
–	Hexazinone	200	53	–	70	–	87	–	80	–	45	–
–	Terbacil	250	45	–	75	–	93	–	63	–	18	–
–	Terbacil	500	48	–	73	–	100	–	97	–	55	–
–	Paraquat	31	78	–	67	–	95	–	90	–	72	–
–	Paraquat	62	85	–	95	–	100	–	100	–	88	–
Cmpd 2												
62	–		5	–	8	–	40	–	47	–	28	–

Application Rate (g a.i./ha)			DIGSA		BRADC		CHEAL		AMARE		SETFA	
			Obsd.	Exp.	Obsd.	Exp.	Obsd.	Exp.	Obsd.	Exp.	Obsd.	Exp.
125	–		15	–	17	–	55	–	68	–	32	–
62	Atrazine	125	8	13	20	40	95	92	95	89	28	42
62	Atrazine	250	13	19	22	29	93	99	95	99	23	58
62	Diuron	250	45	24	85	93	98	100	98	100	63	70
62	Diuron	500	75	57	87	98	100	100	100	100	70	83
62	Hexazinone	100	48	17	73	98	87	98	87	95	37	55
62	Hexazinone	200	60	65	85	93	90	99	98	99	55	70
62	Terbacil	250	98	27	62	95	100	99	100	99	35	50
62	Terbacil	500	98	67	93	100	100	100	100	99	75	59
62	Paraquat	31	83	79	88	93	80	93	90	100	78	88
62	Paraquat	62	83	76	100	97	100	100	97	100	92	95
Cmpd 6												
62	–		8	–	15	–	43	–	28	–	15	–
125	–		13	–	40	–	68	–	60	–	33	–
62	Atrazine	125	8	13	35	28	87	81	80	55	20	15
62	Atrazine	250	15	13	23	19	98	97	98	82	42	30
62	Diuron	250	20	71	92	73	100	99	100	96	58	45
62	Diuron	500	55	66	98	87	100	100	100	100	77	72
62	Hexazinone	100	13	43	98	68	97	87	90	91	37	39
62	Hexazinone	200	63	57	92	75	98	93	98	86	58	53
62	Terbacil	250	23	49	95	79	98	96	98	73	30	30
62	Terbacil	500	65	52	100	77	100	100	98	98	43	62
62	Paraquat	31	78	80	92	72	88	97	100	93	83	76
62	Paraquat	62	75	86	97	96	100	100	100	100	93	90

Application Rate (g a.i./ha)			ABUTH		XANST		ECHCG		ZEAMD		IPOCO	
			Obsd.	Exp.	Obsd.	Exp.	Obsd.	Exp.	Obsd.	Exp.	Obsd.	Exp.
–	Atrazine	125	15	–	45	–	20	–	3	–	52	–
–	Atrazine	250	25	–	72	–	23	–	12	–	75	–
–	Diuron	250	77	–	93	–	62	–	20	–	92	–
–	Diuron	500	100	–	100	–	98	–	28	–	100	–
–	Hexazinone	100	82	–	100	–	15	–	45	–	92	–
–	Hexazinone	200	77	–	100	–	53	–	53	–	100	–
–	Terbacil	250	92	–	68	–	15	–	30	–	78	–

Application Rate (g a.i./ha)			ABUTH Obsd.	ABUTH Exp.	XANST Obsd.	XANST Exp.	ECHCG Obsd.	ECHCG Exp.	ZEAMD Obsd.	ZEAMD Exp.	IPOCO Obsd.	IPOCO Exp.
–	Terbacil	500	100	–	97	–	63	–	75	–	100	–
–	Paraquat	31	70	–	100	–	45	–	43	–	58	–
–	Paraquat	62	92	–	87	–	77	–	63	–	90	–
Cmpd 2												
62	–		17	–	50	–	13	–	25	–	17	–
125	–		18	–	58	–	8	–	65	–	27	–
62	Atrazine	125	48	42	88	92	28	37	23	42	60	78
62	Atrazine	250	62	69	90	96	57	78	20	39	83	82
62	Diuron	250	75	100	98	100	67	83	25	45	80	89
62	Diuron	500	100	92	98	100	90	94	55	55	100	98
62	Hexazinone	100	60	100	98	100	25	37	30	40	83	78
62	Hexazinone	200	88	98	100	100	45	52	30	46	98	96
62	Terbacil	250	100	100	98	100	90	67	25	51	90	82
62	Terbacil	500	100	100	98	100	100	97	60	61	95	89
62	Paraquat	31	43	82	88	100	48	89	47	42	50	89
62	Paraquat	62	88	98	100	100	77	89	42	42	100	98
Cmpd 6												
62	–		27	–	67	–	17	–	22	–	22	–
125	–		47	–	63	–	63	–	28	–	28	–
62	Atrazine	125	30	38	83	82	28	34	23	24	73	63
62	Atrazine	250	63	45	92	91	75	36	18	31	78	81
62	Diuron	250	100	83	100	98	80	68	27	38	87	94
62	Diuron	500	90	100	100	100	93	98	40	44	98	100
62	Hexazinone	100	100	87	100	100	28	29	20	57	73	94
62	Hexazinone	200	97	83	100	100	45	61	28	63	95	100
62	Terbacil	250	100	94	100	89	62	29	35	45	78	83
62	Terbacil	500	100	100	100	99	97	69	48	81	87	100
62	Paraquat	31	78	78	100	100	87	54	23	56	87	67
62	Paraquat	62	97	94	100	96	87	81	23	71	98	92

Application Rate (g a.i./ha)			AVEFA Obsd.	AVEFA Exp.	TRZAS Obsd.	TRZAS Exp.	ALOMY Obsd.	ALOMY Exp.
–	Atrazine	125	13	–	3	–	3	–
–	Atrazine	250	28	–	8	–	28	–

Application Rate (g a.i./ha)		AVEFA Obsd.	AVEFA Exp.	TRZAS Obsd.	TRZAS Exp.	ALOMY Obsd.	ALOMY Exp.
--	Diuron 250	15	--	30	--	25	--
--	Diuron 500	47	--	40	--	43	--
--	Hexazinone 100	53	--	35	--	40	--
--	Hexazinone 200	62	--	60	--	78	--
--	Terbacil 250	68	--	55	--	62	--
--	Terbacil 500	97	--	90	--	97	--
--	Paraquat 31	42	--	35	--	60	--
--	Paraquat 62	63	--	83	--	73	--
Cmpd 2							
62	--	8	--	8	--	15	--
125	--	15	--	10	--	13	--
62	Atrazine 125	18	29	25	34	20	34
62	Atrazine 250	55	36	47	37	52	43
62	Diuron 250	30	51	33	61	32	58
62	Diuron 500	48	72	52	66	33	72
62	Hexazinone 100	53	74	47	68	58	70
62	Hexazinone 200	70	94	60	93	93	93
62	Terbacil 250	87	54	87	61	90	70
62	Terbacil 500	92	91	95	94	97	92
62	Paraquat 31	65	31	22	48	47	47
62	Paraquat 62	50	51	57	61	50	93
Cmpd 6							
62	--	10	--	15	--	18	--
125	--	25	--	30	--	33	--
62	Atrazine 125	23	22	28	18	22	20
62	Atrazine 250	30	35	32	22	33	41
62	Diuron 250	47	24	58	41	50	39
62	Diuron 500	70	52	63	49	67	53
62	Hexazinone 100	72	58	65	45	65	51
62	Hexazinone 200	93	66	92	66	92	82
62	Terbacil 250	50	71	58	62	65	69
62	Terbacil 500	90	97	93	92	90	98
62	Paraquat 31	25	48	43	45	38	67
62	Paraquat 62	47	67	58	86	92	78

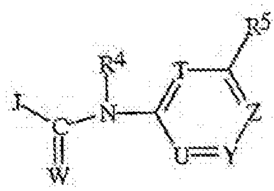
* Application rates are grams of active ingredient per hectare (g a.i./ha). "Obsd." is observed effect. "Exp." is expected effect calculated from Colby's Equation.

As can be seen from the results listed in Table J, many of the effects observed were close to additive, but some combinations showed considerably greater than additive (i.e. synergistic) effects or less than additive (i.e. safening) on certain plant species. Particularly noteworthy greater than additive effects were observed for mixtures of Compound 2 with diuron and particularly terbacil on crabgrass, mixtures of Compound 6 with diuron, hexazinone and terbacil on Surinam grass, mixtures of Compound 6 with atrazine on pigweed, and mixtures of Compound 6 with terbacil on barnyardgrass. Some of the mixtures also showed a less than additive effect on wheat and particularly corn.

CLAIMS

What is claimed is:

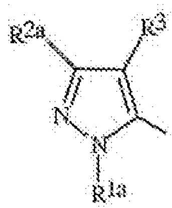
1. A compound selected from Formula **I**, an *N*-oxide or an agriculturally suitable salt thereof,



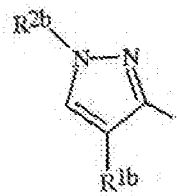
I

wherein

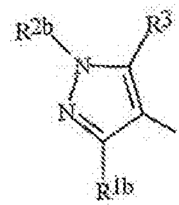
J is



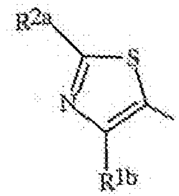
J-1 ,



J-2 ,



J-3 ,



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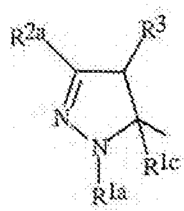
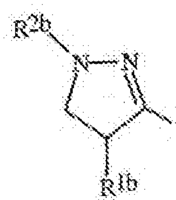
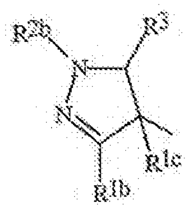


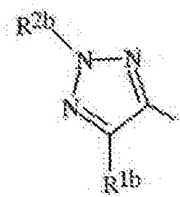
J-5 ,



J-6 ,



J-7 or



J-8 ;

T is CR^6 or N;

U is CR^7 or N;

Y is CR^8 or N;

Z is CR^9 or N;

R^{1a} is H, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1b} is halogen, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1c} is H;

R^{2a} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6

cycloalkylalkyl, C_5–C_6 alkylcycloalkylalkyl, $-CR^{20}(OR^{21})(OR^{22})$ or $SiR^{23}R^{24}R^{25}$;

R^{2b} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl or C_5–C_6 alkylcycloalkylalkyl;

R^3 is H, F or C_1–C_2 alkyl; or

R^{2a} or R^{2b} is taken together with R^3 as $-C(R^{26a})(R^{26b})-(Y^1)_s-(CH_2)_t-(Y^2)_u-$ or $-C(R^{26a})(R^{26b})-(Y^1)_v-CH=CH-(Y^2)_w-$ wherein the left end of the radical is connected as R^{2a} or R^{2b}, and the right end of the radical is connected as R^3;

R^4 is H, C_1–C_2 alkyl, C_2–C_6 alkylcarbonyl, C_2–C_6 alkoxycarbonyl, C_2–C_6 alkoxyalkyl or C_2–C_6 alkylthioalkyl;

R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, $C(NOR^{14})R^{15}$, -CN, OR^{16}, $S(O)_mR^{17}$ $S(O)_2NR^{18}R^{19}$, $OS(O)_2R^{27}$ or $OP(O)R^{28a}R^{28b}$;

R^6 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio; or

R^5 and R^6 are taken together as a radical selected from $-C(W^1)N(R^{11})(CH_2)_n-$ and $-C(NOR^{14})CH_2(CH_2)_n-$ wherein the right end of the radical is connected to the ring at T;

R^7 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio;

R^8 and R^9 are independently selected from H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio and C_1–C_2 fluoroalkylthio;

R^{10} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

R^{11} is H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl; or

R^{10} and R^{11} are taken together as $-(CH_2)_4-$, $-(CH_2)_5-$, $-CH_2CH=CHCH_2-$ or $-(CH_2)_2O(CH_2)_2-$, each optionally substituted with 1–2 C_1–C_2 alkyl;

each R^{12} is independently C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_4 alkoxyalkyl, C_2–C_4 alkylthioalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl or C_4–C_5 cycloalkylalkyl;

R^{13} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{14} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_6 alkylcarbonyl or C_2–C_6 alkoxycarbonyl;

R^{15} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{16} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_3 alkoxyalkyl, C_2–C_3 alkylthioalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_5 cycloalkyl or cyclopropylmethyl;

R^{17} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_4 cycloalkyl or cyclopropylmethyl;

each R^{18} is independently H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

each R^{19} is independently H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl;

R^{20} is C_1–C_4 alkyl, cyclopropyl, cyclopropylmethyl or methylcyclopropyl;

R^{21} is C_1–C_3 alkyl;

R^{22} is C_1–C_3 alkyl; or

R^{21} and R^{22} are taken together as $-CH_2CH_2-$ or $-CH_2CH_2CH_2-$, each optionally substituted with 1–2 methyl;

R^{23} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{24} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{25} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{26a} and R^{26b} are independently H or C_1–C_2 alkyl;

R^{27} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{28a} and R^{28b} are independently C_1–C_2 alkyl or C_1–C_2 alkoxy;

W is O or S;

W^1 is O or S;

Y^1 and Y^2 are independently CH_2, O, S, NH or NCH_3;

m is 0, 1 or 2;

n is 1 or 2;

s is 0 or 1; t is 1 or 2; and u is 0 or 1; provided that the sum of s, t and u is 2 or 3; and

v is 0 or 1; w is 0 or 1; provided that the sum of v and w is 0 or 1;

provided that

(a) when J is J-1, R^{1a} is CH_3 and R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, OR^{16} or $S(O)_mR^{17}$, then at least one of T, U, Y and Z is N or C-F;

(b) when J is J-1, R^{1a} is CH_3, R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, OR^{16} or $S(O)_mR^{17}$ and T is N, then at least one of U, Y and Z is N or C-F;

(c) when R^5 is $C(W^1)NR^{10}R^{11}$ or $C(NOR^{14})R^{15}$, then R^9 is other than alkoxy or alkylthio;

(d) when R^5 is $C(W^1)NR^{10}R^{11}$, then R^6 is other than alkyl or alkoxy;

(e) when R^5 is COR^{13}, then R^{1a} or R^{1b} is selected from the radicals of the group consisting of C_1–C_3 alkyl, C_1–C_3 fluoroalkyl, C_2–C_3 alkenyl, C_2–C_3

fluoroalkenyl, C_2–C_3 alkynyl or C_2–C_3 fluoroalkynyl, each radical unbranched and connected through a terminal end carbon atom to the azole ring;

(f) when R^5 and R^6 are taken together as $-C(W^1)N(R^{10})(CH_2)_n-$ and n is 1, then R^{10} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

(g) when at least one of R^{10} and R^{11} is haloalkyl, then R^{1a} or R^{1b} is CH_2CH_3 or CH_2CF_3 and R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl;

(h) when J is J-2 or J-6, then R^7 and R^9 are H;

(i) when J is J-2 or J-6, and R^{2b} is C_1–C_2 alkyl, then R^{1b} is halogen, C_2–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

(j) when R^{1a} is CH_3 and R^5 is $C(NOR^{14})R^{15}$, then R^7 is other than alkyl;

(k) when T is N, then Z is CR^9;

(l) when T is N, R^7 is alkoxy, then R^{11} is H;

(m) when R^7 and R^9 are F, and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than H;

(n) when Z is N and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than trifluoroethyl;

(o) when J is J-8 and R^{2b} is C_5–C_6 cycloalkyl, then R^5 is $C(O)NR^{10}R^{11}$; and

(p) when J is J-8 and R^7 is other than H, then R^{2b} is *tert*-butyl and R^5 is $C(O)NR^{10}R^{11}$.

2. The compound of Claim 1 wherein J is J-1, J-2, J-3, J-4, J-5 or J-8.

3. The compound of Claim 2 wherein:
R^{1a} or R^{1b} is CH_2CH_3, CH_2CH_2F, CH_2CHF_2, CH_2CF_3 or $CH=CH_2$;
R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl;
R^3 is H;
R^4 is H; and
W is O.

4. The compound of Claim 3 wherein at most one of T, U, Y and Z is N.

5. The compound of Claim 4 wherein
R^5 is $CONR^{10}R^{11}$ or $C(O)OR^{12}$;
R^6 is H or F; and R^7 is H or F;
R^{10} is H or C_1–C_4 alkyl;
R^{11} is C_1–C_4 alkyl; or
R^{10} and R^{11} are taken together as $-CH_2CH=CHCH_2-$; and
R^{12} is C_1–C_3 alkyl.

6. The compound of Claim 5 wherein J is J-1, J-3 or J-5.

7. The compound of Claim 6 wherein
R^5 is $CONR^{10}R^{11}$;
R^{10} is H or C_1–C_2 alkyl; and
R^{11} is C_1–C_3 alkyl; or
R^{10} and R^{11} are taken together as $-CH_2CH=CHCH_2-$.

8. The compound of Claim 7 wherein
R^{2a} is *tert*-butyl or isopropyl; and
R^8 and R^9 are H or F.

9. The compound of Claim 8 which is selected from the group consisting of:

3-(1,1-dimethylethyl)-1-ethyl-*N*-[5-[(ethylamino)carbonyl)-2-fluorophenyl]-1*H*-pyrazole-5-carboxamide;

N-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide;

2-[[(3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-*N*,*N*-dimethyl-4-pyridinecarboxamide;

2-[[[3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazol-5-yl]carbonyl]amino]-*N*-ethyl-4-pyridinecarboxamide;

N-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-1-ethyl-3-(1-methylethyl)-1*H*-pyrazole-5-carboxamide;

N-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-1-(1,1-dimethylethyl)-3-ethyl-1*H*-pyrazole-4-carboxamide;

3-(1,1-dimethylethyl)-1-(2-fluoroethyl)-*N*-[3-[(1*E*)-1-(hydroxyimino)ethyl]phenyl]-1*H*-pyrazole-5-carboxamide;

3-(1,1-dimethylethyl)-1-ethyl-*N*-[5-[(ethylmethylamino)carbonyl]-2-fluorophenyl]-1*H*-pyrazole-5-carboxamide;

3-(1,1-dimethylethyl)-1-ethyl-*N*-[3-[(ethylamino)carbonyl]-4-fluorophenyl]-1*H*-pyrazole-5-carboxamide;

N-[5-[(2,5-dihydro-1*H*-pyrrol-1-yl)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide; and

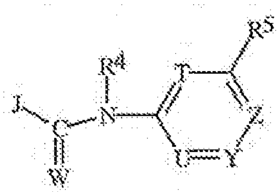
3-(1,1-dimethylethyl)-1-ethyl-*N*-[3-(trifluoromethoxy)phenyl]-1*H*-pyrazole-5-carboxamide.

10. A herbicidal composition comprising a herbicidally effective amount of a compound of Claim 1 and at least one of a surfactant, a solid diluent or a liquid diluent.

11. A method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with a herbicidally effective amount of a compound of Claim 1.

12. A method for controlling the growth of undesired vegetation comprising *Urochloa decumbens* (Staph) R. D. Webster comprising contacting the vegetation or its environment with herbicidally effective amounts of the compound of Claim 1 which is *N*-[5-[(dimethylamino)carbonyl]-2-fluorophenyl]-3-(1,1-dimethylethyl)-1-ethyl-1*H*-pyrazole-5-carboxamide and at least one other herbicide selected from the group consisting of diuron and hexazinone.

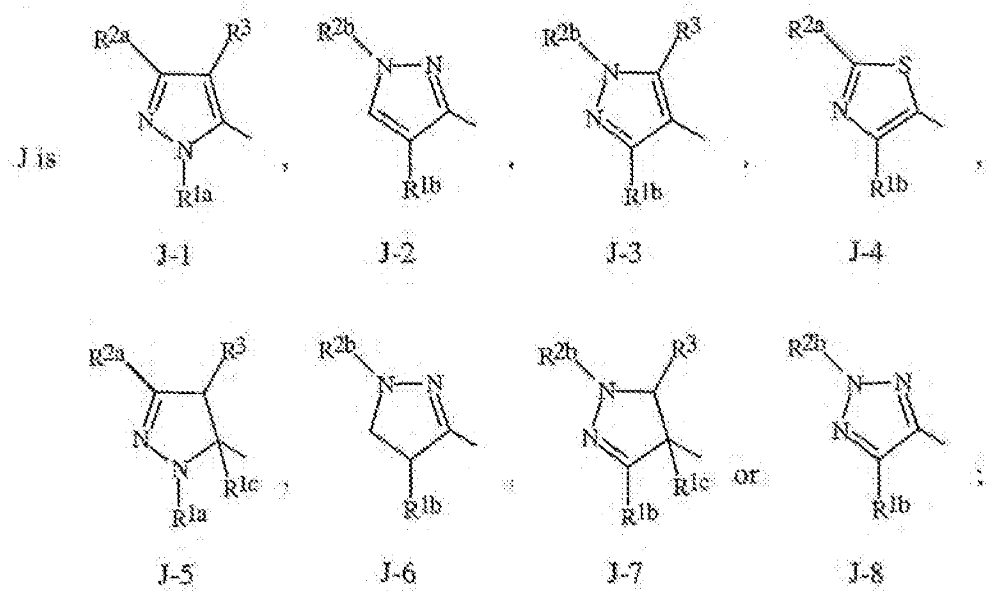
13. A herbicidal mixture comprising a herbicidally effective amount of a compound of Formula **Iz**, an *N*-oxide or an agriculturally suitable salt thereof,



Iz

wherein

J is



T is CR^6 or N;
U is CR^7 or N;
Y is CR^8 or N;

Z is CR^9 or N;

R^{1a} is H, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1b} is halogen, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1c} is H;

R^{2a} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl, C_5–C_6 alkylcycloalkylalkyl, -$CR^{20}(OR^{21})(OR^{22})$ or $SiR^{23}R^{24}R^{25}$;

R^{2b} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl or C_5–C_6 alkylcycloalkylalkyl;

R^3 is H, F or C_1–C_2 alkyl; or

R^{2a} or R^{2b} is taken together with R^3 as -$C(R^{26a})(R^{26b})$-$(Y^1)_s$-$(CH_2)_t$-$(Y^2)_u$- or -$C(R^{26a})(R^{26b})$-$(Y^1)_v$-CH=CH-$(Y^2)_w$- wherein the left end of the radical is connected as R^{2a} or R^{2b}, and the right end of the radical is connected as R^3;

R^4 is H, C_1–C_2 alkyl, C_2–C_6 alkylcarbonyl, C_2–C_6 alkoxycarbonyl, C_2–C_6 alkoxyalkyl or C_2–C_6 alkylthioalkyl;

R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, $C(NOR^{14})R^{15}$, -CN, OR^{16}, $S(O)_mR^{17}$ $S(O)_2NR^{18}R^{19}$, $OS(O)_2R^{27}$ or $OP(O)R^{28a}R^{28b}$;

R^6 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio; or

R^5 and R^6 are taken together as a radical selected from -$C(W^1)N(R^{11})(CH_2)_n$- and -$C(NOR^{14})CH_2(CH_2)_n$- wherein the right end of the radical is connected to the ring at T;

R^7 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio;

R^8 and R^9 are independently selected from H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio and C_1–C_2 fluoroalkylthio;

R^{10} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

R^{11} is H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl; or

R^{10} and R^{11} are taken together as $-(CH_2)_4-$, $-(CH_2)_5-$, $-CH_2CH{=}CHCH_2-$ or $-(CH_2)_2O(CH_2)_2-$, each optionally substituted with 1–2 C_1–C_2 alkyl;

each R^{12} is independently C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_4 alkoxyalkyl, C_2–C_4 alkylthioalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl or C_4–C_5 cycloalkylalkyl;

R^{13} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{14} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_6 alkylcarbonyl or C_2–C_6 alkoxycarbonyl;

R^{15} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{16} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_3 alkoxyalkyl, C_2–C_3 alkylthioalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_5 cycloalkyl or cyclopropylmethyl;

R^{17} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_4 cycloalkyl or cyclopropylmethyl;

each R^{18} is independently H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

each R^{19} is independently H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl;

R^{20} is C_1–C_4 alkyl, cyclopropyl, cyclopropylmethyl or methylcyclopropyl;

R^{21} is C_1–C_3 alkyl;

R^{22} is C_1–C_3 alkyl; or

R^{21} and R^{22} are taken together as $-CH_2CH_2-$ or $-CH_2CH_2CH_2-$, each optionally substituted with 1–2 methyl;

R^{23} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{24} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{25} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{26a} and R^{26b} are independently H or C_1–C_2 alkyl;

R^{27} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{28a} and R^{28b} are independently C_1–C_2 alkyl or C_1–C_2 alkoxy;

W is O or S;

W^1 is O or S;

Y^1 and Y^2 are independently CH_2, O, S, NH or NCH_3;

m is 0, 1 or 2;

n is 1 or 2;

s is 0 or 1; t is 1 or 2; and u is 0 or 1; provided that the sum of s, t and u is 2 or 3; and

v is 0 or 1; w is 0 or 1; provided that the sum of v and w is 0 or 1;

provided that

(a) when R^5 is $C(W^1)NR^{10}R^{11}$ or $C(NOR^{14})R^{15}$, then R^9 is other than alkoxy or alkylthio;

(b) when R^5 is $C(W^1)NR^{10}R^{11}$, then R^6 is other than alkyl or alkoxy;

(c) when R^5 is COR^{13}, then R^{1a} or R^{1b} is selected from the radicals of the group consisting of C_1–C_3 alkyl, C_1–C_3 fluoroalkyl, C_2–C_3 alkenyl, C_2–C_3 fluoroalkenyl, C_2–C_3 alkynyl or C_2–C_3 fluoroalkynyl, each radical unbranched and connected through a terminal end carbon atom to the azole ring;

(d) when R^5 and R^6 are taken together as $-C(W^1)N(R^{10})(CH_2)_n-$ and n is 1, then R^{10} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

(e) when at least one of R^{10} and R^{11} is haloalkyl, then R^{1a} or R^{1b} is CH_2CH_3 or CH_2CF_3 and R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl;

(f) when J is J-2 or J-6, then R^7 and R^9 are H;

(g) when J is J-2 or J-6, and R^{2b} is C_1–C_2 alkyl, then R^{1b} is halogen, C_2–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

(h) when R^{1a} is CH_3 and R^5 is $C(NOR^{14})R^{15}$, then R^7 is other than alkyl;

(i) when T is N, then Z is CR^9;

(j) when T is N, R^7 is alkoxy, then R^{11} is H;

(k) when R^7 and R^9 are F, and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than H;

(l) when Z is N and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than trifluoroethyl;

(m) when J is J-8 and R^{2b} is C_5–C_6 cycloalkyl, then R^5 is $C(O)NR^{10}R^{11}$; and

(n) when J is J-8 and R^7 is other than H, then R^{2b} is *tert*-butyl and R^5 is $C(O)NR^{10}R^{11}$;

and an effective amount of at least one additional active ingredient selected from the group consisting of an other herbicide and a herbicide safener.

14. A herbicidal composition comprising the herbicidal mixture of Claim 13 and at least one of a surfactant, a solid diluent or a liquid diluent.

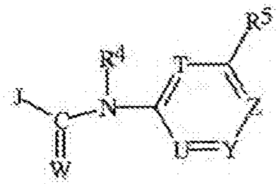
15. A herbicidal mixture of Claim 13 wherein the other herbicide is selected from atrazine, bromacil, diuron, hexazinone, terbacil, glyphosate, glufosinate, rimsulfuron, metsulfuron-methyl, sulfometuron-methyl, ametryn and paraquat.

16. A herbicidal mixture of Claim 13 wherein the safener is selected from 1-bromo-4-[(chloromethyl)sulfonyl]benzene, cloquintocet-mexyl, cyometrinil, dichlormid, 2-(dichloromethyl)-2-methyl-1,3-dioxolane, fenchlorazole-ethyl, fenclorim, flurazole,

fluxofenim, furilazole, isoxadifen-ethyl, mefenpyr-ethyl, (4-methoxy-3-methylphenyl)-(3-methylphenyl)methanone, 1,8-naphthalic anhydride and oxabetrinil.

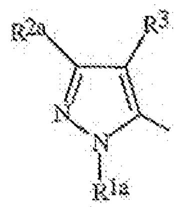
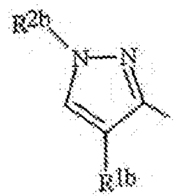
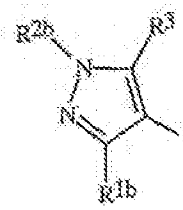
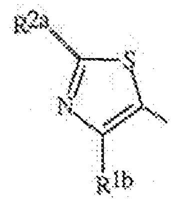
17. A herbicidal mixture of Claim 13 wherein the compound of Formula **Iz** is a compound of Claim 1.

18. A method for selectively controlling the growth of undesired vegetation in a crop comprising contacting the locus of the crop with a herbicidally effective amount of a compound of Formula **Iz**, an *N*-oxide or an agriculturally suitable salt thereof,

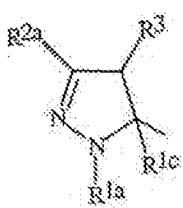
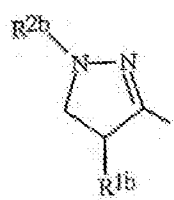
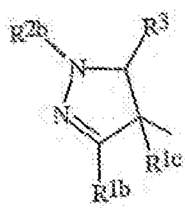
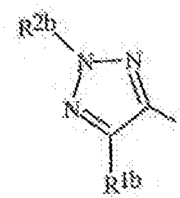


Iz

wherein

J is  ,  ,  ,  ,

J-1 J-2 J-3 J-4

 ,  ,  or  ;

J-5 J-6 J-7 J-8

T is CR^6 or N;

U is CR^7 or N;

Y is CR^8 or N;

Z is CR^9 or N;

R^{1a} is H, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1b} is halogen, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1c} is H;

R^{2a} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl, C_5–C_6 alkylcycloalkylalkyl, $-CR^{20}(OR^{21})(OR^{22})$ or $SiR^{23}R^{24}R^{25}$;

R^{2b} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl or C_5–C_6 alkylcycloalkylalkyl;

R^3 is H, F or C_1–C_2 alkyl; or

R^{2a} or R^{2b} is taken together with R^3 as $-C(R^{26a})(R^{26b})-(Y^1)_s-(CH_2)_t-(Y^2)_u-$ or $-C(R^{26a})(R^{26b})-(Y^1)_v-CH{=}CH-(Y^2)_w-$ wherein the left end of the radical is connected as R^{2a} or R^{2b}, and the right end of the radical is connected as R^3;

R^4 is H, C_1–C_2 alkyl, C_2–C_6 alkylcarbonyl, C_2–C_6 alkoxycarbonyl, C_2–C_6 alkoxyalkyl or C_2–C_6 alkylthioalkyl;

R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, $C(NOR^{14})R^{15}$, -CN, OR^{16}, $S(O)_mR^{17}$ $S(O)_2NR^{18}R^{19}$, $OS(O)_2R^{27}$ or $OP(O)R^{28a}R^{28b}$;

R^6 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio; or

R^5 and R^6 are taken together as a radical selected from $-C(W^1)N(R^{11})(CH_2)_n-$ and $-C(NOR^{14})CH_2(CH_2)_n-$ wherein the right end of the radical is connected to the ring at T;

R^7 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio;

R^8 and R^9 are independently selected from H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio and C_1–C_2 fluoroalkylthio;

R^{10} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

R^{11} is H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_2–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl; or

R^{10} and R^{11} are taken together as $-(CH_2)_4-$, $-(CH_2)_5-$, $-CH_2CH{=}CHCH_2-$ or $-(CH_2)_2O(CH_2)_2-$, each optionally substituted with 1–2 C_1–C_2 alkyl;

each R^{12} is independently C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_4 alkoxyalkyl, C_2–C_4 alkylthioalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl or C_4–C_5 cycloalkylalkyl;

R^{13} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{14} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_6 alkylcarbonyl or C_2–C_6 alkoxycarbonyl;

R^{15} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{16} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_3 alkoxyalkyl, C_2–C_3 alkylthioalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_5 cycloalkyl or cyclopropylmethyl;

R^{17} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_4 cycloalkyl or cyclopropylmethyl;

each R^{18} is independently H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

each R^{19} is independently H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl;

R^{20} is C_1–C_4 alkyl, cyclopropyl, cyclopropylmethyl or methylcyclopropyl;

R^{21} is C_1–C_3 alkyl;

R^{22} is C_1–C_3 alkyl; or

R^{21} and R^{22} are taken together as $-CH_2CH_2-$ or $-CH_2CH_2CH_2-$, each optionally substituted with 1–2 methyl;

R^{23} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{24} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{25} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{26a} and R^{26b} are independently H or C_1–C_2 alkyl;

R^{27} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{28a} and R^{28b} are independently C_1–C_2 alkyl or C_1–C_2 alkoxy;

W is O or S;

W^1 is O or S;

Y^1 and Y^2 are independently CH_2, O, S, NH or NCH_3;

m is 0, 1 or 2;

n is 1 or 2;

s is 0 or 1; t is 1 or 2; and u is 0 or 1; provided that the sum of s, t and u is 2 or 3; and

v is 0 or 1; w is 0 or 1; provided that the sum of v and w is 0 or 1;

provided that

(a) when R^5 is $C(W^1)NR^{10}R^{11}$ or $C(NOR^{14})R^{15}$, then R^9 is other than alkoxy or alkylthio;

(b) when R^5 is $C(W^1)NR^{10}R^{11}$, then R^6 is other than alkyl or alkoxy;

(c) when R^5 is COR^{13}, then R^{1a} or R^{1b} is selected from the radicals of the group consisting of C_1–C_3 alkyl, C_1–C_3 fluoroalkyl, C_2–C_3 alkenyl, C_2–C_3

fluoroalkenyl, C_2–C_3 alkynyl or C_2–C_3 fluoroalkynyl, each radical unbranched and connected through a terminal end carbon atom to the azole ring;

(d) when R^5 and R^6 are taken together as $-C(W^1)N(R^{10})(CH_2)_n-$ and n is 1, then R^{10} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

(e) when at least one of R^{10} and R^{11} is haloalkyl, then R^{1a} or R^{1b} is CH_2CH_3 or CH_2CF_3 and R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl;

(f) when J is J-2 or J-6, then R^7 and R^9 are H;

(g) when J is J-2 or J-6, and R^{2b} is C_1–C_2 alkyl, then R^{1b} is halogen, C_2–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

(h) when R^{1a} is CH_3 and R^5 is $C(NOR^{14})R^{15}$, then R^7 is other than alkyl;

(i) when T is N, then Z is CR^9;

(j) when T is N, R^7 is alkoxy, then R^{11} is H;

(k) when R^7 and R^9 are F, and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than H;

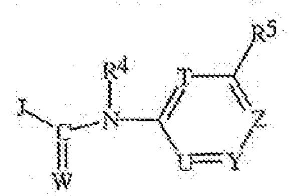
(l) when Z is N and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than trifluoroethyl;

(m) when J is J-8 and R^{2b} is C_5–C_6 cycloalkyl, then R^5 is $C(O)NR^{10}R^{11}$; and

(n) when J is J-8 and R^7 is other than H, then R^{2b} is *tert*-butyl and R^5 is $C(O)NR^{10}R^{11}$;

and an antidotally effective amount of a safener.

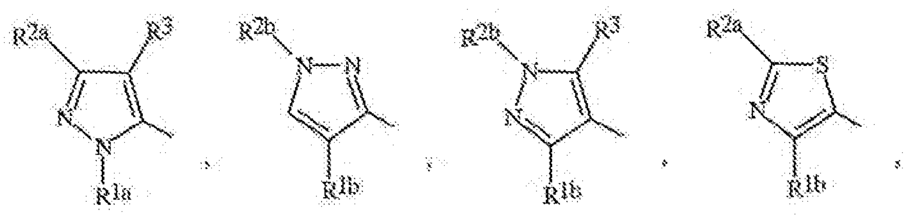
19. A method for selectively controlling the growth of undesired vegetation in a crop comprising contacting the locus of the crop with a herbicidally effective amount of a compound of Formula **Iz**, an *N*-oxide or an agriculturally suitable salt thereof,



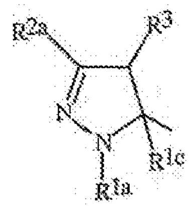
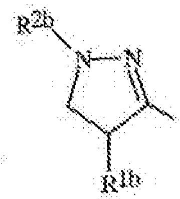
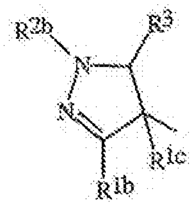
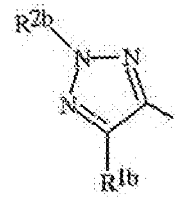
Iz

wherein

J is



J-1 J-2 J-3 J-4

 ,  ,  or  ;

J-5 J-6 J-7 J-8

T is CR^6 or N;

U is CR^7 or N;

Y is CR^8 or N;

Z is CR^9 or N;

R^{1a} is H, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1b} is halogen, C_1–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

R^{1c} is H;

R^{2a} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl, C_5–C_6 alkylcycloalkylalkyl, -$CR^{20}(OR^{21})(OR^{22})$ or $SiR^{23}R^{24}R^{25}$;

R^{2b} is C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkoxyalkyl, C_2–C_6 alkylthioalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_2–C_6 alkynyl, C_2–C_6 haloalkynyl, C_3–C_6 cycloalkyl, C_4–C_6 alkylcycloalkyl, C_3–C_6 halocycloalkyl, C_4–C_6 cycloalkylalkyl or C_5–C_6 alkylcycloalkylalkyl;

R^3 is H, F or C_1–C_2 alkyl; or

R^{2a} or R^{2b} is taken together with R^3 as -$C(R^{26a})(R^{26b})$-$(Y^1)_s$-$(CH_2)_t$-$(Y^2)_u$- or -$C(R^{26a})(R^{26b})$-$(Y^1)_v$-CH=CH-$(Y^2)_w$- wherein the left end of the radical is connected as R^{2a} or R^{2b}, and the right end of the radical is connected as R^3;

R^4 is H, C_1–C_2 alkyl, C_2–C_6 alkylcarbonyl, C_2–C_6 alkoxycarbonyl, C_2–C_6 alkoxyalkyl or C_2–C_6 alkylthioalkyl;

R^5 is $C(W^1)NR^{10}R^{11}$, $C(O)OR^{12}$, COR^{13}, $C(NOR^{14})R^{15}$, -CN, OR^{16}, $S(O)_mR^{17}$ $S(O)_2NR^{18}R^{19}$, $OS(O)_2R^{27}$ or $OP(O)R^{28a}R^{28b}$;

R^6 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio; or

R^5 and R^6 are taken together as a radical selected from $-C(W^1)N(R^{11})(CH_2)_n-$ and $-C(NOR^{14})CH_2(CH_2)_n-$ wherein the right end of the radical is connected to the ring at T;

R^7 is H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio or C_1–C_2 fluoroalkylthio;

R^8 and R^9 are independently selected from H, F, C_1–C_2 alkyl, C_1–C_2 fluoroalkyl, C_1–C_2 alkoxy, C_1–C_2 fluoroalkoxy, C_1–C_2 alkylthio and C_1–C_2 fluoroalkylthio;

R^{10} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

R^{11} is H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl; or

R^{10} and R^{11} are taken together as $-(CH_2)_4-$, $-(CH_2)_5-$, $-CH_2CH{=}CHCH_2-$ or $-(CH_2)_2O(CH_2)_2-$, each optionally substituted with 1–2 C_1–C_2 alkyl;

each R^{12} is independently C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_4 alkoxyalkyl, C_2–C_4 alkylthioalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl or C_4–C_5 cycloalkylalkyl;

R^{13} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{14} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_6 alkylcarbonyl or C_2–C_6 alkoxycarbonyl;

R^{15} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{16} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_3 alkoxyalkyl, C_2–C_3 alkylthioalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_5 cycloalkyl or cyclopropylmethyl;

R^{17} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_4 alkenyl, C_3–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_4 cycloalkyl or cyclopropylmethyl;

each R^{18} is independently H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

each R^{19} is independently H, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_2–C_5 alkenyl, C_3–C_5 haloalkenyl, C_3–C_5 alkynyl, C_3–C_5 cycloalkyl, C_4–C_5 cycloalkylalkyl, C_1–C_3 alkoxy, C_2–C_5 alkoxyalkyl or C_2–C_5 alkylthioalkyl;

R^{20} is C_1–C_4 alkyl, cyclopropyl, cyclopropylmethyl or methylcyclopropyl;

R^{21} is C_1–C_3 alkyl;

R^{22} is C_1–C_3 alkyl; or

R^{21} and R^{22} are taken together as $-CH_2CH_2-$ or $-CH_2CH_2CH_2-$, each optionally substituted with 1–2 methyl;

R^{23} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{24} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{25} is C_1–C_2 alkyl or C_1–C_2 haloalkyl;

R^{26a} and R^{26b} are independently H or C_1–C_2 alkyl;

R^{27} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or cyclopropyl;

R^{28a} and R^{28b} are independently C_1–C_2 alkyl or C_1–C_2 alkoxy;

W is O or S;

W^1 is O or S;

Y^1 and Y^2 are independently CH_2, O, S, NH or NCH_3;

m is 0, 1 or 2;

n is 1 or 2;

s is 0 or 1; t is 1 or 2; and u is 0 or 1; provided that the sum of s, t and u is 2 or 3; and

v is 0 or 1; w is 0 or 1; provided that the sum of v and w is 0 or 1;

provided that

(a) when R^5 is $C(W^1)NR^{10}R^{11}$ or $C(NOR^{14})R^{15}$, then R^9 is other than alkoxy or alkylthio;

(b) when R^5 is $C(W^1)NR^{10}R^{11}$, then R^6 is other than alkyl or alkoxy;

(c) when R^5 is COR^{13}, then R^{1a} or R^{1b} is selected from the radicals of the group consisting of C_1–C_3 alkyl, C_1–C_3 fluoroalkyl, C_2–C_3 alkenyl, C_2–C_3 fluoroalkenyl, C_2–C_3 alkynyl or C_2–C_3 fluoroalkynyl, each radical unbranched and connected through a terminal end carbon atom to the azole ring;

(d) when R^5 and R^6 are taken together as $-C(W^1)N(R^{10})(CH_2)_n-$ and n is 1, then R^{10} is C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_4 alkenyl, C_2–C_4 alkoxymethyl or C_2–C_4 alkylthiomethyl;

(e) when at least one of R^{10} and R^{11} is haloalkyl, then R^{1a} or R^{1b} is CH_2CH_3 or CH_2CF_3 and R^{2a} or R^{2b} is *tert*-butyl, isopropyl or cyclopropyl;

(f) when J is J-2 or J-6, then R^7 and R^9 are H;

(g) when J is J-2 or J-6, and R^{2b} is C_1–C_2 alkyl, then R^{1b} is halogen, C_2–C_4 alkyl, C_1–C_4 fluoroalkyl, C_2–C_4 alkenyl, C_2–C_4 fluoroalkenyl, C_2–C_4 alkynyl or C_2–C_4 fluoroalkynyl;

(h) when R^{1a} is CH_3 and R^5 is $C(NOR^{14})R^{15}$, then R^7 is other than alkyl;

(i) when T is N, then Z is CR^9;

(j) when T is N, R^7 is alkoxy, then R^{11} is H;

(k) when R^7 and R^9 are F, and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than H;

(l) when Z is N and one of R^{10} and R^{11} is H, then the other of R^{10} and R^{11} is other than trifluoroethyl;

(m) when J is J-8 and R^{2b} is C_5–C_6 cycloalkyl, then R^5 is $C(O)NR^{10}R^{11}$; and

(n) when J is J-8 and R^7 is other than H, then R^{2b} is *tert*-butyl and R^5 is $C(O)NR^{10}R^{11}$.

wherein seed from which the crop is grown is treated with an antidotally effective amount of a safener.

20. The method of Claim 19 wherein the safener comprises 1,8-naphthalic anhydride.

21. The method of Claim 19 wherein the compound of Formula **Iz** is a compound of Claim 1.